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RADIO MARKETS OF THE WORLD----1930

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RADIO MARKETS OF THE WORLD, 1930

BY

LAWRENCE D. BATSON
Electrical Equipment Division

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FOREWORD

For 10 years radio broadcasting has been developing throughout the world, and as yet no evidence of abatement in its progress has become apparent. In few sections do the people remain ignorant of the uses of radio, and many policies which have prohibited or seriously restricted its use in the past have practically disappeared. The United States has played an outstanding part in the preliminary "missionary" work, and followed it up by satisfying the demands of foreign markets for both broadcasting and receiving equipment as rapidly as the demands appeared.

The world investment in radio broadcasting and receiving was calculated as of November, 1929, at $1,502,019,720, of which $1,473,279,344 represented the listeners' outlay, or approximately 98 per cent of the total investment. Ninety per cent of the operating expenses are borne by listeners. Broadcasting and reception expenses total $743,324,380 annually, of which $671,898,523 is spent in the upkeep and operation of receiving sets, and $71,425,857 for broadcasting stations. Prorated according to the number of receivers, the cost of broadcasting per set per year is thus fixed at $2.96, compared with $27.84 annual operating cost of the receiver itself.

During the past nine years United States exports of radio equipment have amounted to nearly $60,000,000. The number of receiving sets in use has increased to more than 24,000,000. The first broadcasting station is now supplemented by some 1,300 others. Where 10 years ago a small group of scientists and experimenters labored to develop the radiophone to a stage where music could be broadcast and received with moderate satisfaction, to-day millions of people are engaged in work based upon broadcasting. Newly created positions include the many involved in the design, manufacture, and sale of broadcasting and receiving equipment, in service and repair work, in the management and operation of broadcasting stations, in performing before the microphone, in publishing radio magazines or work in radio departments of other periodicals, the preparation of radio advertising material, and many other employments. Nor are these the only jobs broadcasting has made, because it has brought about expansion in innumerable secondary industries.

The amount of money invested to accomplish this development can not be estimated with even reasonable accuracy. Outside the United States statistics are not generally collected, and even when they are the results are seldom made available for publication. Conditions vary, and while they may be easily described, they do not lend themselves to "yardstick" applications.

The purpose of this publication is to present accurate information as to the development of radio broadcasting in foreign countries, for the guidance of American exporters of radio apparatus in entering and maintaining sales in such countries. The data cover

various subjects, including the characteristics of the population, the laws governing the use of receiving sets, the physical characteristics of the various countries, and the present status of radio development in each. These data have been obtained from all available sources. In addition to reports from consular officers of the Department of State and representatives of the Department of Commerce stationed abroad, official reports of various foreign governments, private publications, trade journals, and encyclopedic works were consulted. Questions asked by exporters in the past have been analyzed, and so far as possible have been answered herein, this work involving much additional research. Similarly, criticisms of three previous bulletins on this subject have been given full consideration. These findings have been analyzed and compared with reported market conditions. From the results, this publication has been prepared.

WILLIAM L. COOPER, *Director*,
Bureau of Foreign and Domestic Commerce.

NOVEMBER, 1930.

RADIO MARKETS OF THE WORLD

INTRODUCTION

The radio broadcast is universally recognized as an efficient and economical means of communication, of entertainment, of education, and withal a notable public service. The operation of a receiver is extremely simple. Radio shares with the telephone, automobile, airplane, electric light, and bathtub recognition as a symbol of the universally high standard of living that marks the present age. It has so many angles of popular appeal that there are few people, indeed, who do not have one or more "weaknesses" that radio will satisfy.

In its service radio enters into the foundation of civilization. It is an important adjunct to the government, the press, wire communications, transportation, commerce, and the postal system in the assured exchange of benefits among peoples.

While it is giving the people a great moral foundation for international peace and good will, radio continues to develop a catholicity of tastes in the phonic arts. The classification of music as good or bad solely according to whether it might be classical or popular at its inception has been broken down. The person who is technically interested in music has lost caste as the sole arbiter and court of final appeal as to what constitutes good music, for the great public has taken over that function. Music is now more universally considered good if it is fitting in theme to its sphere, well written, and well played or sung.

The popularization and development of wide appreciation of tonal rather than rhythmic compositions has been a characteristic service of radio. Music is also indebted to radio in the matter of instruments. The intensive search for new effects, that programs might be more varied, has resulted in the rediscovery of many old and forgotten instruments, particularly the harpsichord and lute. There is every possibility that future efforts will bring to light more such discoveries. Only one new instrument—the theremin—can as yet be credited to radio; but this, too, is expected to be joined in time by a growing list of musical devices.

RECENT RADIO ADVANCES

The outstanding development in radio during 1929 appears to have been the beginning of scheduled transatlantic broadcasts. The feat had been accomplished occasionally during a period of several years, but the stage was at last finally attained where regular and frequent exchanges of programs could be made and satisfactory reception for chain rebroadcasting could be assured in most cases.

Short waves have brought out-of-the-way parts of the world into touch with world centers of entertainment and affairs. It is but a matter of time before the necessary transmitters can be provided to complete 2-way communication with phone, as radiotelegraphy has already been established, with even the more distant areas. Much in this respect remains to be accomplished, but improvements are rapidly being made. The results are as strikingly apparent as they have been in the case of equipment for home reception. The sound quality of short-wave broadcasts depends upon further research in the same direction as that which has resulted in improved tonal characteristics of short-span long-wave reception.

The future of television remains an enigma, but that progress is being made in experiment is evidenced by the frequent press notices devoted to this subject. The apparatus for transmitting and for satisfactory reception of still pictures and images of moving objects is already available. Even that designed for highly detailed transmissions of the motion-picture type having been successfully demonstrated during the past year. The difficulties to be solved seem to be only those necessary to bring the cost within the reach of the buying public. This is itself somewhat of a problem, and experimenters are not inclined to make definite promises as to the immediate future. The needed discoveries, however, may be made at any time, and it is not improbable that thoroughly reliable and satisfactory television apparatus faithfully transmitting and receiving moving images will be available within a short time.

Legislation and regulation have undergone little change. Countries appear to have settled policies as to the major regulations. Any alterations made have been in the matter of details and have little effect on the use of radio by the public generally. A very few countries have yet to recognize broadcasting with special legislation, and in each of these the appropriate State officer is administering all questions in accordance with existing laws as interpreted by some definite policy. Subsequent legislation is not apt to seriously change the status of broadcasting or reception.

Programs have taken more definite form. Novelties have become rare, and those that have proved adaptable to broadcasting have found place in permanent program practice. The hours of the day and the days of the week have been analyzed by broadcasters to allocate each variety of program to those times when the class of people most likely to be interested will be listening in the greatest numbers. This has been done in many countries even to the point of extreme standardization. Improvement, however, is the universal object and continues wherever broadcasting is done.

While a number of new broadcasting stations were opened during 1929, few were designed to serve new areas. Those regions where local broadcasting is not yet provided are subject to conditions or restrictions which can not readily be overcome, usually because of sparse population and restricted purchasing power. Adverse climatic conditions have stimulated rather than retarded broadcasting development, except in the extreme tropical areas.

The number of receiving sets in use has continued to increase. A few countries show decreases, but most have had moderate advancement. The change from battery to socket-power sets is progressing,

but nearly one-half of the number in use are battery sets. Lack of central-station electric service or only part-time service is responsible for most of the sales of battery sets now being made. Crystal sets are also sold and used in surprising numbers, particularly in Europe, where about 50 per cent of the continental total is of this class.

Though the Washington Conference agreement (1927) was to have been effective January 1, 1929, and changes made within one year thereafter to accord with it, broadcasting has been affected very little. Call letters were to have been changed to three-letter combinations for land stations, but this has been impracticable since the number of such combinations available was too few for the purpose. Changes in call-letter allocations have necessitated general reassignments of calls in some countries. In Europe where wave lengths up to 3,000 meters were formerly used for broadcasting, reallocations of long-wave stations to new channels were made, the new lengths being from 1,340 to 1,875 meters and from 200 to 545 meters.

PROGRAMS

The purchaser of a receiving set is not motivated in his choice by the same considerations as the purchaser of other commodities. The sole motives for buying radio are amusement and service, principally amusement. Radio "tinkering" as a pastime is still to be found, though it is by no means as prevalent as in former years.

To retain interest, pleasing radio programs have had to be provided. Broadcasters found that but a small percentage of the listeners are completely pleased with any individual program. A wide variety of features necessary to maintain interest among the whole listening public can be accomplished only by making available simultaneously a number of programs within the receiving range of each set. The basing of broadcast policies on a prevalence of modern or highly sensitive receivers has not been found an effective practice. Instead of stimulating the market for new sets it has tended to annihilate interest on the part of those whose still serviceable sets have been rendered obsolete.

Radio programs have been drawn from all fields where there is reason to believe suitable material may be found. Some of these fields have received greater attention than others, but the efforts of the broadcasters, wherever the listener interest has been recognized as the principal factor in broadcasting success, have been expended in the direction of improving program balance. This effort is common to all parts of the world, regardless of the method employed for radio control. Music of all types, narrative, and the play are three fields susceptible to wide variety within themselves, and they are being constantly explored in the search for something new. Even vaudeville has been successfully presented. The news bulletin, an exclusively European development for several years, is now a well-established part of American programs. The broadcast of public and sporting events is now developed in almost every country where there is broadcasting. There is little expectation, however, that the sport broadcasts of other countries will be as successful as in the United States. The major American games—baseball and football—are sufficiently dramatic that broadcast descrip-

tions are of interest even to people who are not followers of these sports. This characteristic is probably not as common to the national pastimes of other countries.

Upon this general skeleton has been developed what may be called the "universal program." The arrangement in every case is similar, and the interest maintained in each type of program is about the same in all countries. There is extreme variation in the method of presentation; our own familiarity with the Spanish broadcasts from stations in Cuba and Mexico may be cited as exemplifying this. There is the further difference that lies in the availability of artists, which varies from country to country and city to city throughout the world, as in the United States.

In developing the receiving-set market abroad it is necessary for manufacturers to take an interest in broadcasting. Even though direct advertising may not be permitted, the nature of the general market for radio sets depends directly on the quality of the broadcasts, and its development may well be expected to warrant a certain amount of assistance in the preparation of programs. Voluntary acknowledgements through the press of such assistance may on occasion prove even more beneficial than if made over the air. The widest variety possible within the bounds of taste, and the most complete elimination of the mediocre must be maintained if the demand for radio equipment is to spread further.

Though the field of radio presentation is the greatest ever offered by any medium, it has been rigidly restricted to aural transmissions, and the types of programs restricted to a few general classes. Each of these classes is such as to appeal to a single person, who may enjoy one or more of them, remain unaffected by others, and have a strongly adverse reaction to the remainder. The more apparent of these classes are:

- Music, instrumental:
  - Solo.
  - Duet, trio, and quartet, etc. — Classical, including symphony, opera, sacred, etc.; Popular, including dance.
  - Orchestra. — Novelty.
  - Band.
- Music, vocal:
  - In all combinations of voice. — Opera; Balads, pastorals.; Popular novelties.; Religious.; Characteristic, racial and national.
- Performances:
  - Dialogue.
  - Narrative.
  - Plays.
- Speech:
  - Prepared speeches, propaganda, etc.
  - Public events, descriptive.
  - Public service, weather, markets, news, time, etc.
- Religious services.

The 1930 British Broadcasting Corporation Yearbook concisely outlines the basic considerations in program construction as follows:

> Experience has shown that the problem of building programs for broadcasting falls quite naturally into two parts. On the one hand there is the actual quality of each individual program, and on the other, the general balance and layout of the whole field of programs. Taking the week as a unit, the program builder must so balance one type of program with another that the final scheme reflects what he takes to be the choice of the majority of the listening audience, without leaving unsatisfied the demands of certain minorities, and without refusing anything which is of particular interest and value in its own field, whatever that field may be.

Though this quotation somewhat reflects the individual policies of the British Broadcasting Corporation, the basis is one upon which any provision for foreign broadcasts must be constructed if the ultimate service in increased sales of sets is to be attained.

The program cycle, ordinarily the week, is also universal in general arrangement. There are four groups of programs in this respect—daily, weekly, intermittent, and special. Daily features are ordinarily relegated to the morning hours and are of a service nature; weekly programs are usually of entertainment, presented on a more extensive scale, being either special performances of musical organizations or public events. Experience, the cost of presentation, and the effort to carry interest from broadcast to broadcast without "wearing out" the interest of the listening public, combine to dictate the frequency of presentation, though each program manager interprets the comparative values of these factors in a different way.

RADIO ADVERTISING

The matter of advertising, which has been discussed in the United States to a considerable extent, is found to be treated variously abroad. There is a definite indication of a trend toward the adoption of the American sponsored-program system in some quarters, but as yet many countries cling to the policy of listeners' licenses. One objection raised in the licensing countries is based on the belief that listeners would be subjected to extended advertising talk. Articles descriptive of American broadcasting, advanced as the outstanding example of this system of financing, frequently appear in foreign publications. These are sometimes colored as arguments against the American method, from which the reader gathers that most American programs consist of direct advertising speeches only. As presented, this argument favoring the retention of license fees seems unanswerable. However, familiarity with actual conditions obtaining here would do much to dispel this impression.

Another difficulty confronting the authorities in the licensing countries is the problem of maintaining a reasonable control of the actual contact of paid radio programs.

DISTANCE RECEPTION

That the reception of distant programs is an important part of the listener's desires is shown by the almost complete disappearance from the market of receivers restricted to local reception. Local receivers, with high reception qualities, could be constructed for sale at a low cost, but the demand to warrant their production would be so limited, even in localities where broadcasting facilities are ideal, as to raise the price level of such receivers above those of sets capable of long-range reception. Selectivity, in countries where a number of stations are within receiving range, is a prime selling point for individual instruments. Where there is

no present indication of listener interest in distant reception, the reason is usually found to be that the arrangement of broadcast wave lengths or the climatic conditions are such as to preclude satisfactory reception from distances.

In some areas throughout the world there are only isolated stations of local power, usually operating only a few hours each day. In all such places distant reception is a necessity if radio broadcasting is to be successful. In the United States the demand for distance is largely latent, but if the means can be found of satisfying it once more, with programs not available on intermediate stations of high power, demand for distant reception will become as popular as it is in foreign countries.

The extent to which selectivity in the receiving set is demanded is entirely dependent upon local broadcasting conditions. Sets capable of sharp tuning have an additional selling feature in such areas as Europe and Australia, where congestion is general, and in countries where stations are principally grouped about the largest cities, as in Mexico and Argentina. Sets of less selectivity are not suited to such places, but might through other advantages be of better service in localities where interference is less and reception from distant stations necessary to have a satisfactorily varied program.

CHAIN AND RELAY BROADCASTS

Two methods have been developed for broadcasting a single program from several stations simultaneously—the chain or American, and the relay or European system. The chief difference depends upon whether the secondary stations operate continuously with the originating stations (the relay system) or only part of the time (chain). During the earlier years relay stations were designed solely for relaying, with a total lack or only a minimum of studio facilities. Chain practice developed from occasional interconnection of stations originally constructed as complete broadcasting units. Both systems have undergone considerable modification, and their operation is now very similar.

The chain system has few variations, but the methods employed in relay systems are sufficiently distinct to have some interest. In Sweden there are two major groups of stations, one owned by the broadcasting monopoly, and the other made up of smaller stations operated by radio clubs. The small stations are of a modified relay classification, broadcasting programs from the monopoly stations three or four days a week and originating their own programs the remaining days. The Swedish method, therefore, may be classified as a chain system. In Germany each main station is assigned a definite territory, with connected relay stations situated where necessary to guarantee proper reception in all parts of the designated area, this being the perfect example of the relay method. The British system, now being abandoned in favor of a more promising arrangement, designated several relay stations over the country, these rebroadcasting the London program, while the remaining stations normally operated independently.

PERSONAL CHARACTERISTICS AFFECTING THE MARKET

Study of the personal factor is one of considerable importance in the marketing of all commodities. The radio market is probably affected by individual characteristics in more ways than other commodity markets. In some parts of the world religion constitutes a retarding influence, but elsewhere religious organizations have adopted radio as a potent aid to the furtherance of their purposes, with results that have proved mutually advantageous. In similar cases various other so-called national characteristics will be found to operate with opposite effect, under varying conditions.

In addition to these more peculiar factors of the radio market, and their effects, there are also several other personal characteristics which apply to the demand for all commodities. These include, among others, individual purchasing power, the standard of living, the existence or absence of competitive desires as concerns the living standards, and the inclination toward frugality in matters beyond strictly necessary comforts.

There is no method by which these personal factors may be exactly measured. Their effects change from year to year. Efforts have been made to express this market element mathematically, but with no exceptional success. The human element is most elusive; similar conditions unexpectedly and sometimes inexplicably reverse their effects. Certain races have been known as free spenders when money was available. Among these, radio sets could not be sold because money is spent as quickly as it is received, and a radio purchase would involve saving for some period beforehand, or credit which dealers could not wisely extend.

CLIMATIC CONDITIONS AND SEASONAL CYCLES

The effect of climate on reception is a most important market factor. Much has been done to eliminate the distadvantages arising in reception from adverse climate, but up to the present time those countries where poor results are obtained find even the improved devices of little use.

The growth of short-wave broadcasting, however, has provided the means of circumventing a large part of this difficulty. It has been found that the short waves carry signals satisfactorily through even the most troublesome atmosphere. The countries bordering the southwestern part of the Caribbean Sea have long been recognized as having the most difficult conditions in the world in this respect. Short-wave broadcasts in a few of these countries are noticeably increasing the interest in radio. Such territory is almost untouched, providing virgin markets for future development. Though the per capita demand may not be large, these markets should be watched closely.

The following table shows the principal climatic characteristics of various areas throughout the world, and the seasons of best radio reception.

WORLD CLIMATE AND RADIO SEASONS

Countries	Summer	Winter	Range of mean temperatures [1]		Mean annual rainfall	Radio reception	
			Monthly	Annual		Possible	Best
			° F.	° F.	Inches		
NORTH AMERICA							
Alaska	Cool	Cold	10- 60	0-50	0- 80	Continuous	Sept.-May.
Canada: South	Warm	do	0- 80	40-70	10- 80	do	Oct.-May.
Central America	Hot	Hot	60-100	80-90	20-120	Sept.-Mar.	Dec.-Jan.
Mexico	do	Cool	30- 90	50-80	0- 80	do	Nov.-Feb.
United States:							
North	Hot and warm.	Cold	20- 90	50-70	20- 60	Continuous	Oct.-May.
South	Hot	Cool	30- 90	50-80	0- 80	do	Nov.-May.
West Indies	do	Hot	70-100	70-90	20- 80	Oct.-Mar.	Nov.-Jan.
SOUTH AMERICA							
Argentina	Hot	Cool	30- 90	40-90	0- 60	Continuous	Apr.-Sept.
Bolivia	(2)	(2)	70- 80	0-60		do	Do.
Brazil	Hot	Hot and warm.	60- 90	70-90	0- 80	May-Oct.	Do.
Chile	(2)	(2)	30- 70	40-70	0- 80	Continuous	Do.
Colombia	Hot	Hot	70-100	80-90	80-120	do	Do.
Ecuador	do	Warm	70- 90	70-90	0- 80	Jan.-Mar.	
Paraguay	do	do	60- 90	70-80	10- 40	Apr.-Oct.	
Peru	(2)	(2)	60- 80	60-80	0- 80	Continuous	May-Sept.
Uruguay	Hot	Warm	50- 90	60-90	20- 60	May-Oct.	July-Sept.
Venezuela	do	Hot	70-100	80-90	40-100	Continuous	Apr.-Oct.
						Jan.-Mar.	
EUROPE							
Balkan States	Hot and warm.	Cool and cold.	30- 90	50-70	40- 80	Sept.-May	Nov.-Feb.
Baltic States	Warm	Cold	10- 70	30-50	10- 40	Continuous	Sept.-May
British Isles	do	Cool	30- 70	40-60	40- 60	do	Do.
Central States	Hot	do	20- 80	40-60	10- 60	do	Do.
Latin Europe	Warm	Cold	30- 90	50-70	10- 80	Sept.-Jan.	Oct.-Apr.
Scandinavia	(2)	(2)	10- 70	10-50	10- 60	Continuous	Sept.-May
Russia			0- 80	20-60	0- 40	Sept.-May	
ASIA							
China	Hot	Cool	10- 90	30-90	0- 80	Sept.-May	Nov.-Feb.
Malay Peninsula	do	Warm	70- 90	70-90	80-120	Oct.-May	Dec.-Feb.
OCEANIA							
Australia (except arid regions of north).	Hot	Warm	40- 90	50-70	10- 80	Continuous	Apr.-Sept.
AFRICA							
Algeria	Hot	Warm	50-100	60-80	10- 30	Sept.-May	Nov.-Apr.
Sahara	do	do	50-100	70-90	0- 20		
Sudan	do	Hot	60- 90	70-90	0-160		
South Africa	do	Warm	50- 90	60-90	20- 80	Continuous	Apr.-Oct.

[1] Temperature zones of 10° variation were used in making up this table. The extremes of the zones encountered in each country are taken for the ranges. Thus, a point at which the monthly mean ranges from 43° to 68° is given as having a range of from 40° to 70°. Rainfall is similarly measured in 10-inch zones.
[2] Climatic variations are due mainly to altitudes along the tropical west coast of South America, the difference between seasons not being great. The very narrow coastal strip is hot throughout the year but includes only a very small percentage of the territory of these countries.
[3] Varies widely.

SHIPPING SEASONS

The appropriate season for shipping radio to foreign countries is indicated by the results of an analysis made of United States exports as reported by months. The findings are shown in the following table, which considers receiving-set and vacuum-tube shipments. These commodities were selected as representing, respectively, the growth of the radio market and the maintenance of equipment in use. Statistics for 1928 and 1929 were combined for the study and treated as a single year. The 2-month figures for the period indicated as January-February are based on the sum of the figures for January and February, 1928, and the same months in 1929. The world is divided into four climatic zones, each country being considered as totally within the zone in which the preponderance of its population is to be found.

The zoning is based on mean annual temperature ranges, since the purpose of this analysis is to determine the time of year at which each market is at its best (midwinter) and the relation of the actual shipping periods to such seasons. The north and south zones have definite contrasts of summer and winter seasons, regardless of the actual range of climate in other respects, while the torrid division for the greater part has less sharply defined seasons and a generally higher temperature range.

From the radio standpoint, the north zone has constant reception with noticeably better results between October and March. The north Torrid Zone has satisfactory reception during longer or shorter periods extending more or less equally before and after the middle of December. The south zone experiences best reception from April to September, with constant reception possible. The south torrid is similar to the north torrid with the season generally reaching its middle in June or July. In the torrid divisions, the quality of reception is dependent upon the effects of the rainy season, the time of which varies between different regions with little apparent regard for the solar season.

The countries included in each zone are:

NORTH ZONE

North America: Canada, Greenland, Miquelon and St. Pierre Islands, Newfoundland and Labrador, Bermuda, Barbados.
Europe: All countries.
Asia: China, Japan, Kwantung, Palestine, Persia, Siam, Russia in Asia, Syria, Turkey.

NORTH TORRID ZONE

North America: Mexico, Central America, West Indies, except Bermuda and Barbados.
South America: Ecuador, Colombia, Venezuela, British Guiana, Surinam, French Guiana.
Asia: Aden, Arabia, India, British Malaya, Ceylon, French Indo-China, Hong Kong, Philippine Islands.
Africa: Egypt, Algeria, Tunisia, Morocco, Canary Islands.

SOUTH TORRID ZONE

South America: Bolivia, Brazil, Paraguay, Peru.
Asia: Netherland East Indies.
Oceania: All except Australia and New Zealand.
Africa: All except Egypt, Algeria, Tunisia, Morocco, Canary Islands.

SOUTH ZONE

South America: Argentina, Chile, Falkland Islands, Uruguay.
Oceania: Australia, New Zealand.

In the following table the "per cent of period total" refers to that portion of the total shipments during the 2-month periods that were allocated to each zone, and the "per cent of zone total" to that portion of the year's total shipments to the zone represented by each period.

Thus, of the total set shipments during the January-February period, 64 per cent went to the north, 10 per cent to the north torrid, 3 per cent to the south torrid, and 23 per cent to the south zone. Of the total set shipments to the north zone, 10 per cent were shipped during the first, 5 per cent during the second, 6 per cent during the third, 17 per cent during the fourth, 33 per cent during the fifth, and 29 per cent during the sixth period. Of the total year's shipments of sets, 64 per cent went to the north, 12 per cent to the north torrid, 3 per cent to the south torrid, and 20 per cent to the south zone.

The table shows that the peak shipments to the north zone occur in early fall, to the north torrid in late fall, to the south torrid and south in late spring. Not much period variation is noted in respect to the torrid divisions.

RADIO SHIPPING SEASONS

[Based on United States exports for 1928-1929]

Item	Jan.-Feb.	Mar.-Apr.	May-June	July-Aug.	Sept.-Oct.	Nov.-Dec.	Total
NORTH ZONE							
Sets:							
Per cent of period total	64	37	40	64	77	70	64
Per cent of zone total	10	5	6	17	33	29	100
Tubes:							
Per cent of period total	49	35	33	29	40	44	38
Per cent of zone total	17	14	14	12	18	25	100
NORTH TORRID ZONE							
Sets:							
Per cent of period total	10	13	13	11	10	15	12
Per cent of zone total	9	10	11	15	23	32	100
Tubes:							
Per cent of period total	10	9	12	9	19	20	14
Per cent of zone total	10	10	14	10	24	32	100
SOUTH TORRID ZONE							
Sets:							
Per cent of period total	3	4	5	3	2	2	3
Per cent of zone total	10	14	16	18	20	22	100
Tubes:							
Per cent of period total	5	7	8	25	8	6	10
Per cent of zone total	7	11	13	41	15	13	100
SOUTH ZONE							
Sets:							
Per cent of period total	23	41	43	22	12	12	20
Per cent of zone total	11	21	21	17	14	16	100
Tubes:							
Per cent of period total	36	49	47	37	33	30	38
Per cent of zone total	13	19	20	16	15	17	100

RECEIVING-SET STATISTICS

One and one-half billion people live within constant receiving distance of broadcasting stations, based on the League of Nations estimate of the world population at 1,906,000,000. The number of receiving sets in use is over 24,000,000, practically all of them being within the areas where reception of at least one station is certain. With an average of five members to each family, 120,000,000 people are equipped with receiving facilities, or 6.3 per cent of the total population in these zones. To put radios in all their homes, 320,000,000 sets would be required. With broadcasting facilities provided throughout the world, over 380,000,000 sets would be required. These figures, of course, must be greatly modified by factors representing

purchasing power, personal desires, and many other considerations before they give any indication of the potential markets.

The number of receiving sets in any country is a matter of conjecture. In countries where registration for a receiver or a license for its ownership or operation is required, statistics are sometimes published; these provide a basic figure which may be employed in making estimates. There are several countries which do not publish returns, though registration or license is required, and others which do not require registration or license. In general, trade estimates are frequently far more reliable than license counts.

One of the major questions in regard to licensing is the enforcement of the law. The percentage of unlicensed sets in any country where licenses are required is admittedly large. Sets may be easily concealed, and so may be the necessary traffic to provide sets for those desiring to conceal them after the purchase. These conditions arise in direct ratio to the cost of licenses and the rigor of the restrictions imposed. Hence licensing statistics do not give a complete total of the sets in use. Another qualifying factor is that the licenses generally cover sets and not their owners; additional licenses are required for successive sets used during the year, though in some countries steps have been taken to eliminate the worst features of this requirement.

Estimates of the numbers of sets illegally operated appear to be made with a paucity of facts. Where the attempts to enforce the law are carried on with less energy, it is entirely possible that authoritative estimates of the number of such sets may be made, inasmuch as the traffic and operation are not so carefully hidden. When such estimates are made they are generally based on parallel but unrelated statistics. In the absence of anything more reliable they are of some service.

Where registration or licensing is not required, there are no official statistics to which to refer. Estimates, however, are more likely to be authoritative, but much depends upon their source. Those which have been accepted are in each case the ones which are believed to be from the most reliable of the sources considered. The British electrical press has provided several of the figures used, but since the origin of many of these is obscure, they have been accepted only in the absence of estimates made in the country under consideration. Consular officers of the United States Department of State and representatives of the Department of Commerce in various countries provided most of the local estimates used. Members of the radio trades have proved another fruitful source.

There has been no lack of estimates, so far as the United States is concerned, in past years. Most of those considered appear to have been based on conditions in a small portion of the country. Where the New York area was considered as being representative of the entire country, for instance, estimates have run from 12,000,000 to 15,000,000. Estimates as a whole, however, average considerably lower, 10,500,000 being the average of the most probable estimates for the beginning of the 1929–30 winter season. Statistics on the number of families owning radio sets (not the number of sets in use) are to be made available by the United States Bureau of the Census, compiled from returns on this question in the 1930 decen-

nial census. This will be the first actual count ever attempted in this country and will be the basis for future estimates.

In one or two cases the number of sets exported from the United States during one or more of the last few years will show incongruity when compared with the number of sets estimated to be in use. No attempt has been made to adjust the estimates to agree in this connection, since it is not improbable that the sets imported have not been put into service; they might remain on the dealers' shelves, delivery might have been refused, they might have been reexported, they might have been destroyed, or other diversion might have followed their importation, none of which would show in the United States export statistics.

The following statement shows the number of receiving sets in use, according to the most reliable figures as defined above:

North America:	
Alaska	1,250
Bahamas	300
Barbados	250
Bermuda	700
British Honduras	75
Canada	423,557
Canal Zone	160
Costa Rica	250
Cuba	28,875
Dominican Republic	1,250
French West Indies	100
Greenland	25
Guatemala	250
Haiti	750
Honduras	78
Jamaica	250
Mexico	100,000
Miquelon and St. Pierre	25
Netherland West Indies	50
Newfoundland and Labrador	1,250
Nicaragua	45
Panama, Republic of	300
Porto Rico	5,000
Salvador	51
Trinidad and Tobago	35
United States	10,500,000
Virgin Islands	50
Continent	11,064,926
South America:	
Argentina	400,000
Bolivia	65
Brazil	175,000
British Guiana	15
Chile	35,000
Colombia	350
Ecuador	150
Falkland Islands	15
French Guiana	8
Paraguay	150
Peru	70,000
Surinam	18
Uruguay	17,150
Venezuela	2,000
Continent	699,921
Europe:	
Albania	12
Austria	371,011
Azores	200
Belgium	63,125
Bulgaria	1,612
Czechoslovakia	300,000
Danzig	155
Denmark	343,000
Estonia	14,426
Finland	90,232
France	1,500,000
Germany	3,066,682
Gibraltar	150
Greece	1,000
Hungary	240,000
Iceland	50
Irish Free State	26,000
Italy	250,000
Latvia	33,000
Lithuania	12,000
Luxemburg	2,000
Madeira	180
Malta	250
Netherlands	152,000
Norway	75,000
Poland	202,586
Portugal	2,500
Rumania	25,000
Spain	500,000
Sweden	450,000
Switzerland	77,959
United Kingdom	3,093,000
Yugoslavia	40,000
Continent	10,933,130
Europe-Asia:	
Russia	500,000
Turkey	5,200
Total [1]	505,200
Asia:	
Aden	5
Arabia	12
Ceylon	1,500
China	10,000

[1] Not included in total for Europe or Asia

Asia—Continued.	
Chosen	12,000
French India	50
French Indo-China	25
Hong Kong	700
India	3,600
Iraq	24
Japan	641,774
Kwantung	3,910
Macao	40
Netherland East Indies	106
Palestine	150
Persia	300
Philippine Islands	1,300
Siam	25
Straits Settlements	500
Syria	150
Continent	676,171
Oceania:	
American Samoa	12
Australia	311,322
British Oceania	250
French Oceania	30
Guam	12
Hawaii	15,000
New Zealand	52,124
Total	379,250
Africa:	
Algeria	9,500
Angola	50
Basutoland	10
Bechuanaland	15
Belgian Congo	6
British Somaliland	5
British West Africa	50
Canary Islands	200
Egypt	4,000
Ethiopia	2
French Equatorial Africa	500
French Morocco	2,500
Italian Africa	250
Kenya	250
Liberia	5
Madagascar	150
Mozambique	75
Northern Rhodesia	25
Southern Rhodesia	150
Southwest Africa	50
Swaziland	5
Tanganyika	10
Tunisia	1,000
Union of South Africa	20,000
Zanzibar	5
Continent	38,963
World	24,297,561

THE RADIO INVESTMENT

There has been much interest in the question of the direct and indirect investment in radio, so far as broadcasting is concerned. Statistics are nonexistent and authoritative estimates are also lacking. There is, however, an estimate of the world total investment in receiving sets in use and broadcasting stations in operation, which is given here as the only one available. The calculations were made as of the month of November, 1929.

BROADCASTING-STATION INVESTMENT

The investment in broadcasting stations totaled $28,740,376, with 1,250 stations operating, of which approximately half were in the United States. This valuation was built up from reports submitted to the Federal Radio Commission by American broadcasters, giving a total valuation for each station. Two items enter into this valuation, the studio and the transmitter.

In the matter of studios it was observed that these tended decidedly toward fixed amounts. Small stations—up to and including 100 watts—often reported no studio investment beyond bare microphone and control equipment, while others of this class have more pretentious fully equipped studios which equal those of stations of higher power. The sum of their several studio investments averaged approximately $1,000, and this figure was therefore taken as representing the average of all world stations in this power class.

Complete studio arrangements showed an unusual similarity in value, $4,000 being reported in most cases, and only a very few were at much variance. Stations between 100 and 1,000 watts in

general reported a single studio, those up to 10,000, two studios, and the higher powered group, three, as an average. In this, too, there was wide divergence, but these averages were maintained.

The per watt transmitter values are dependent upon the power of the station according to logarithmic recession, as shown by these reports. The equipment was usually given a valuation somewhat lower than manufacturer's quotations.

The 1,250 stations operating at the time of this calculation were divided among the seven major divisions of the world, according to their power rating as shown in the following table. Subsequent changes in the broadcasting structures have not been exceptional and would probably not affect the total valuation more than 2 to 5 per cent.

NUMBER OF BROADCASTING STATIONS THROUGHOUT THE WORLD, BY CONTINENTS AND POWER RATING

Power rating in watts	North America	South America	Europe	Russia and Turkey	Asia	Oceania	Africa	Total
2½						1		1
5	4					1		5
7						1		1
7½	2					2		4
8		2						2
10	18	4				1		23
12		2						2
15	19					2		21
17						1	1	1
20	10	1	1	2		5		19
22½	1							1
25	2		1				1	4
30	8		1					9
35		1				1		2
40		1			1			2
45				1				1
50	80	14	3		6	2		105
60	1	1						2
65		1						1
70	1							1
75	2							2
100	178	14	12		1	5	2	212
110	1							1
120		1						1
130			8					8
150	1		3	1		1		6
160						1		1
180			1	1				2
200	7	3	17	2	1		1	31
240					1			1
250	75	3	16	1	3	2		100
300	3	1	2	1				7
320						1		1
350	3	1	2	1				7
400	1	1	2					4
500	164	10	17	3	6	5	1	206
550		2						2
600			5					5
630			1					1
700			7	1				8
750	7		7					14
800				1				1
1,000	99	13	16	5	5	4	2	144
1,200			1	14				15
1,250	1	1						2
1,500	2	7	16	1	2	2	1	30
1,650	1							1
1,800				1				1
2,000	7	3	3	2	1	1	2	19
2,200			1					1
2,500	8		2		1			11
3,000		1	3		2	1		7
3,500	2							2
3,600			1					1
4,000	1		9	5				15

NUMBER OF BROADCASTING STATIONS THROUGHOUT THE WORLD, BY CONTINENTS AND POWER RATING—Continued

Power rating in watts	North America	South America	Europe	Russia and Turkey	Asia	Oceania	Africa	Total
5,000	41	1	4	2	2	1		51
6,200			1					1
7,000			4					4
7,500	2		2					4
8,000			1					1
10,000	11		8	1	7			27
12,000			3					3
12,500	1							1
15,000	1		1				1	3
20,000	1		1					2
25,000	1		2					3
30,000	1		2					3
40,000			2	1				3
50,000	7							7
60,000			1					1
Not reported [1]	6	7	26		7	8	5	59
Total	781	96	216	47	46	49	15	1,250

[1] Considered hereafter as 1,690 watts.

The valuation of individual stations, and the total for each power group, accords with the following table, allowing 10 per cent above the transmitter and studio values as defined for remote-broadcast equipment, office furniture, extra transmitters, and other miscellaneous investment. Care should be exercised that the allowances for studio and for miscellaneous equipment are not accepted as correct for each individual station or power group, inasmuch as they represent averages. Real-estate investment is not included, but rental value is allowed under annual expenses.

VALUATION OF WORLD BROADCASTING STATION EQUIPMENT, BY POWER RATING

Power rating in watts	Studio valuation	Transmitter valuation	Miscellaneous investment	Total invested per station	Number of stations	Grand total
2½	$1,000	$220	$122	$1,320	1	$1,320
5	1,000	360	136	1,496	5	7,480
7	1,000	450	145	1,595	1	1,595
7½	1,000	475	148	1,625	4	6,500
8	1,000	500	150	1,650	2	3,300
10	1,000	600	160	1,760	23	40,480
12	1,000	660	166	1,726	2	3,452
15	1,000	780	178	1,858	21	39,018
17	1,000	850	185	2,035	1	2,035
20	1,000	950	195	2,045	19	38,855
22½	1,000	1,000	200	2,200	1	2,200
25	1,000	1,150	215	2,365	4	9,460
30	1,000	1,300	230	2,530	9	22,770
35	1,000	1,450	245	2,695	2	5,390
40	1,000	1,600	260	2,860	2	5,720
45	1,000	1,700	270	2,970	1	2,970
50	1,000	1,900	290	3,190	105	334,955
60	1,000	2,100	310	3,410	2	6,820
65	1,000	2,250	325	3,575	1	3,575
70	1,000	2,350	335	3,686	1	3,686
75	1,000	2,500	350	3,850	2	7,700
100	1,000	3,100	410	4,510	212	956,120
110	4,000	3,300	730	8,130	1	8,130
120	4,000	3,500	750	8,250	1	8,250
130	4,000	3,800	780	8,580	8	86,640
150	4,000	4,200	820	9,020	6	54,120
160	4,000	4,400	840	9,240	1	9,240
180	4,000	4,700	870	9,570	2	19,140
200	4,000	5,000	900	9,900	31	128,700
240	4,000	5,800	980	10,780	1	10,780
250	4,000	6,000	1,000	11,000	100	1,100,000

VALUATION OF WORLD BROADCASTING-STATION EQUIPMENT, BY POWER RATING—Continued

Power rating in watts	Studio valuation	Transmitter valuation	Miscellaneous investment	Total invested per station	Number of stations	Grand total
300	4,000	6,750	1,075	11,825	7	82,775
320	4,000	7,000	1,100	12,100	1	12,100
350	4,000	7,500	1,150	12,650	7	88,550
400	4,000	8,250	1,225	13,475	4	53,900
500	4,000	10,000	1,400	15,400	206	3,172,400
550	4,000	10,500	1,450	15,950	2	31,900
600	4,000	11,000	1,500	16,500	5	82,500
630	4,000	12,000	1,600	17,600	1	17,600
700	4,000	12,500	1,650	18,150	8	145,200
750	4,000	13,000	1,700	18,700	14	261,800
800	4,000	13,500	1,750	19,250	1	19,250
1,000	4,000	16,000	2,000	22,000	144	3,168,000
1,200	8,000	18,000	2,600	28,600	15	429,000
1,250	8,000	18,500	2,650	29,150	2	58,300
1,500	8,000	21,000	2,900	31,900	30	957,000
1,650	8,000	22,500	3,050	33,550	1	33,550
1,800	8,000	24,000	3,200	35,200	1	35,200
2,000	8,000	26,000	3,400	37,400	19	710,600
2,200	8,000	28,000	3,600	39,600	1	39,600
2,500	8,000	31,000	3,900	42,900	11	471,900
3,000	8,000	35,000	4,300	47,300	7	331,100
3,500	8,000	39,000	4,700	51,700	2	103,400
3,600	8,000	40,000	4,800	52,800	1	52,800
4,000	8,000	42,500	5,050	55,550	15	833,250
5,000	8,000	50,000	5,800	63,800	51	3,253,800
6,200	8,000	60,000	6,800	74,800	1	74,800
7,000	8,000	62,000	7,000	77,000	4	308,000
7,500	8,000	66,000	7,400	91,400	4	365,600
8,000	8,000	70,000	7,800	85,800	1	85,800
10,000	8,000	82,500	9,050	99,550	27	2,687,850
12,000	12,000	96,000	10,800	118,800	3	356,400
12,500	12,000	100,000	11,200	123,200	1	123,200
15,000	12,000	115,000	12,700	139,700	3	419,100
20,000	12,000	140,000	15,200	167,200	2	334,400
25,000	12,000	165,000	17,700	194,700	3	584,100
30,000	12,000	180,000	19,200	211,200	3	633,600
40,000	12,000	230,000	24,200	266,200	3	798,600
50,000	12,000	280,000	29,200	321,200	7	2,248,400
60,000	12,000	320,000	33,200	365,200	1	365,200
1,690 [1]	8,000	22,500	3,050	33,550	59	1,979,450
Total						28,740,376

[1] This power rating represents the estimated average for stations not reported.

THE RECEIVING-SET INVESTMENT

The investment in receiving sets, as of November, 1929, amounted to $1,473,279,344. To determine this valuation, the number of receiving sets in use was divided by the apparent ratio maintaining in each major area into crystal, battery, and socket-power categories. Only scattered statistics were available, but a study of these and general information, evolved the following data:

PER CENT OF RECEIVING SETS IN WORLD USE, BY CATEGORIES, 1929

Major area	Per cent crystal sets	Per cent battery sets	Per cent socket-power sets	Total
North America	1	47	52	100
South America	2	73	25	100
Europe	10	40	50	100
Russia and Turkey	20	45	35	100
Asia	5	75	20	100
Oceania	2	70	28	100
Africa	2	78	20	100

Derived from these constants, the number of sets in each category and area was found to be as follows:

NUMBER OF RECEIVING SETS IN WORLD USE, BY CATEGORIES, 1929

Major area	Crystal	Battery	Socket power	Total sets
North America	110,649	5,200,515	5,753,762	11,064,926
South America	10,698	390,493	133,730	534,921
Europe	1,093,313	4,373,252	5,466,565	10,933,130
Russia and Turkey	101,040	227,340	176,820	505,200
Asia	33,809	507,128	135,234	676,171
Oceania	7,585	265,475	106,190	379,250
Africa	779	30,391	7,793	38,963
Totals	1,357,873	10,994,594	11,780,094	24,132,561

Crystal sets were valued at $5, including head set, aerial, and ground, and considered as having had one year's (average) use at 40 per cent depreciation, or a current value of $3, or a total value of $4,073,619.

Of the battery sets, 50 per cent were considered as using storage batteries for A power and 30 per cent employed B battery eliminators. To dispense with unnecessary operations 50 per cent of the allowance for a storage A battery and 30 per cent of the allowance for a B battery eliminator were added to the valuation of each battery set. The sets were valued at $50 each, storage batteries at $10, and B battery eliminators at $25. A–B eliminators are accounted at $35 and absorbed in the allowances for separate A storage batteries and B battery eliminators. The allowances per set were, respectively, $5 and $7.50, giving each set a total value of $62.50, from which is deducted depreciation for four years' average service at 10 per cent per year, or 40 per cent, $25. The current value of battery sets is thus placed at $37.50. This is higher than the markets in some sections, but in such places the prices have been driven down by "distressed" merchandise, both new and used. The 10,994,594 battery sets at this price represent an investment of $408,997,265.

Socket-power sets were valued at $100, with an average of one year's use, at 10 per cent depreciation, or $10, making a current value of $90 each, or a total value of $1,060,208,460, represented by 11,780,094 sets.

The grand total receiving investment of $1,473,279,344 thus shown includes in all cases the necessary accessories of an investment character, such as loud-speaker, aerial and ground, lightning arrester, and similar devices. Furniture, however, often of extremely expensive character, is not considered. Cabinets costing of themselves from $50 to $500 are frequently purchased but do not add to the quality or efficiency of reception; therefore all sets are considered as being installed in the popular-price cabinets which are of minor importance in the fixing of prices.

CONCLUSIONS

The total broadcasting investment is $28,740,376, or the equivalent of $1.19 per set of the 24,132,561 receivers in use. The receiving set investment is $1,473,279,344, or over fifty times that in broadcasting stations. By allowing one-half, the United States broadcasting in-

vestment is $14,370,188. It is estimated that 105,000 crystal, 4,935,000 battery, and 5,460,000 socket-power sets are in use in this country, with a total value of $676,777,500, or approximately 45 per cent of the world total.

ANNUAL EXPENSES

RECEIVING

The expenses involved in broadcasting and reception total $743,324,380 annually, of which $671,898,523 is spent in the upkeep and operation of receiving sets. Receiving license fees and repairs are not included.

The annual depreciation of receiving sets is considered at 10 per cent, and interest on investment at 6 per cent of the receiver investment, or $147,327,934 and $88,396,760, respectively, these items totaling $235,724,695.

Power supply is an important item of expense. Dry-cell purchases for 7,696,216 sets using dry B batteries and for 5,497,297 sets using dry A batteries, are averaged at $10 per year per set of either A or B cells. Dry A batteries cost $54,972,970 and B battery blocks $76,962,160 per year. C batteries are included in these allowances. Storage A battery recharging is also averaged at $10 per year, which averages between home and commercial charging costs; 5,492,970 sets use storage A batteries and that item totals $54,972,970. The average cost of current used through B battery eliminators, numbering 3,298,378, is $12 per year, or $39,580,536. The meter charge for socket-power sets averages $6 per year for each of the 11,780,094 sets, or $70,680,564. The total power supply expense is $297,169,200.

Vacuum-tube replacements are averaged at 3 per set per year for the 10,994,594 battery sets, making 32,983,782 tubes at $1, or $32,983,782. An average of six tubes are required for socket-power sets, or 70,680,564 tubes for 11,780,094 sets, at $1.50 per tube, or $106,020,846. Tube replacements cost $139,004,628.

In recapitulation, interest and depreciation are entered at $235,724,695, power supply at $297,169,200, and tubes at $139,004,628. The total receiving cost, less repairs and license fees comes to $671,898,523, or $27.84 as the average annual cost per set. The expense of operating battery receivers amounts to $324,911,980, or $29.55 per average set; socket-power receivers $346,334,763, or $35.40 per set, and of crystal sets, interest and depreciation only, comes to $651,779, or $0.48 per set.

BROADCASTING EXPENSE

The annual cost of broadcasting was fixed at $71,425,857. Interest at 6 per cent on the $28,740,376 investment totals $1,724,422. Because of the necessity of maintaining more nearly perfect operation, the life of a broadcasting station is much shorter than of a receiving set, though replacement is necessarily made piecemeal in most cases. Depreciation was figured at 25 per cent per year, or $7,185,094, a total for interest and depreciation of $8,909,516.

Operating costs, as reported to the Federal Radio Commission, were in unusual agreement, and averaged $14.95 per watt per year, with little variation between stations of different power groups. The total wattage used in broadcasting was 1,986,879; the cost of operating broadcasting stations during the year was therefore $29,703,841. This figure included pay roll, rent, heat, light, power, taxes, and repairs, other than those included under normal depreciation.

Wire charges for chain operation can not be so accurately determined from existing statistics, but expenditures reported in the United States warrant the fixing of the world cost at $10,000,000.

Talent is yet more difficult of accounting. Individual stations seldom pay high rates for talent, and may have no expenditures of this kind. Fabulous fees are reputed to be paid to certain artists for chain features, but these sums must be divided among many stations in an accounting of this character. The majority of the stations are of 500 watts or less, few of which involve any expenditure for talent. Whether this cost devolves upon a sponsor or upon the broadcasting station is of no moment in this respect, since the sponsor merely assumes this part of the broadcasting cost. No satisfactory figure has been evolved for this cost, but the preponderance of small stations undoubtedly brings the per station cost to a very low figure. Allowing $50 per night per station, which is estimated to be a liberal allowance, the world total is $22,812,500 per year.

The annual cost of broadcasting thus is set at:

Interest	$1,724,422
Depreciation	7,185,094
Operation	29,703,841
Wire charges	10,000,000
Talent	22,812,500
Total	71,425,857

Prorated according to the number of receivers, the cost of broadcasting per set per year is thus fixed at $2.96, compared with $27.84 annual operating cost of the receiver itself.

THE REGULATION OF RADIO

Recognizing radio's many advantages, with little attendant disadvantage to existing rights and privileges, most of the governments of the world have bent unusual efforts toward encouraging the development of radio broadcasting and reception. There remain very few governments which deny the public the privilege of using it. In only a few countries is political influence used to exploit radio for personal advantage; wherever censorship operates it almost universally secures the use of radio to the best advantage of the listener.

The extent to which restrictive laws—as are all laws governing radio—are enforced and affect the market can not be ascertained. There is perhaps no such thing as an informed, disinterested observer from whom a definite and unbiased opinion can be obtained.

Two classes of radio regulations exist, those adopted nationally and those provided by international convention. International regulations are designed to promote the efficiency of all kinds of radio communications by avoiding interference between stations of different countries and by promoting uniformity of practice to facilitate the use of radio in general.

Interference is eliminated by providing for the use of various wave bands for dissimilar purposes; thus much ship-to-shore and

commercial code which might interfere on the broadcasting band through lack of international uniformity is allocated to noninterfering channels, while a ship passing through foreign waters is assured of the same wave lengths for its communications which it would have in its home port. Contact is also possible in communications through wave-length control, since it is known that all stations of certain categories will be listening on certain wave lengths, whatever might be their nationality.

The control exercised over call letters is effective in avoiding confusion, for the identity of a station becomes positive when there is no duplication of call letters between countries. International regulation specifies call groups to serve this purpose.

The types of apparatus to be used in various services are often affected, particularly since obsolete types have created considerable interference in the past. Under present arrangements these will be withdrawn entirely from use.

The field covered by these laws is being constantly expanded as new conditions arise, and late developments give them wider latitude in such requirements. These purposes are made effective through national legislation in the signatory countries, usually forming the central structure of the national system of regulation.

Effective January 1, 1929, the regulations of the Washington Radio Conference of 1927 make provision for international relations in the use of radio. They specify that the choice of apparatus and devices to be used by a station shall be unrestricted except by national regulations, provided the waves emitted comply with the international agreements; that each country shall have entire freedom in the assignment of wave lengths and wave types if no interference with stations in another country will result, but where such interference is to be expected frequencies and wave types shall be assigned in accordance with the provisions of the regulations, that the wave lengths to be used for broadcasting shall be from 200 to 545 meters and from 1,340 to 1,875 meters, and that the call letters of all land stations shall be changed to three-letter combinations. Four-letter calls are reserved for ship, and five-letter calls for aircraft stations.

The degree to which radio broadcasting is regulated in various countries is widely divergent. Absolute prohibition is maintained in a few countries, while at the opposite extreme utter freedom within the bounds of public convenience, interest, and necessity prevails.

In countries where monopolies have not been declared, any person or firm showing satisfactory general qualifications will usually be given permission to broadcast at its own expense. Licenses may be required for receiving sets in such countries, but the fees revert entirely to the Government.

The monoply system of broadcasting has been growing in popularity in countries where licenses in any form are required. Austria, Czechoslovakia, Germany, the Irish Free State, Italy, Poland, Sweden, the United Kingdom, Yugoslavia, Japan, Australia, New Zealand, and other countries are under the monopoly system, as well as Latvia and several other countries where the demand for broadcasting permits is so limited that there has been no opposition to the monopoly system.

It is a peculiarity of broadcasting that it is subject to all of the regulations provided for other kinds of radio transmission and reception, in addition to many other specific regulations that govern broadcasting alone. Thus, broadcasting may be prohibited—and the number of reasons why it is prohibited is equal to the number of countries where these prohibitions maintain—or it may be permitted under monopoly, held either by the Government or by one or more private concessionaires, or it may be permitted to any number of citizens showing the proper qualifications, which themselves vary without limitation.

Reception may be prohibited, and this has been done in some countries in the past, though such rigid limitations are disappearing. It may be necessary to secure permission to receive, or at least to deliver a proper notification to a designated Government agency that the set is installed. The unrestricted use of receiving sets is permitted in only a few countries, and one or two others add only such requirements as are outlined above.

Most countries require the listener to pay some fee for the privilege. Installation fees, annual license fees, and subscription fees are common; these may be collected by the Government or by the broadcaster, and in either case may be shared with the other agency. They vary from a few cents to several dollars a year, and may or may not be expected to pay the costs of broadcasting.

The following data show the outstanding characteristics of radio regulation of the different countries.

Broadcasting unrestricted (subject only to general license and laws for safeguarding of radio services and national interests in general, no monopoly or prohibition maintaining); receiving unrestricted (not subject to payment of any license or subscription fees, nor prohibited to residents generally); importing and merchandising unrestricted (subject only to general laws governing all commodities, no monopoly being granted):

Barbados.	Paraguay.	Italian Africa.
Cuba.	Surinam.	Kenya.
Dominican Republic.	Uruguay.	Liberia.
Greenland.	Portugal.	Mozambique.
Honduras.	Macao.	Northern Rhodesia.
Netherland West Indies.	Netherland East Indies.	Southern Rhodesia.
United States.	Persia.	Spanish Africa.
British Guiana.	Angola.	Swaziland.
Falkland Islands.	British Somaliland.	Tanganyika.
French Guiana.	British West Africa.	Zanzibar.

Broadcasting and receiving unrestricted; importing or merchandising subject to restrictions: China; importing subject to permit.

Broadcasting, importing, and merchandising unrestricted; receiving restricted:

Bermuda, license required.
British Honduras, annual license $5.
Canada, annual license $1.
French West Indies, annual license $0.40.
Guatemala, installatjon permit $5.
Jamaica, annual license.
Mexico, registration, no fee.
Miquelon and St. Pierre, annual license $0.40.
Nicaragua, annual license.
Trinidad and Tobago, annual license $2.83 to $4.87.
Argentina, registration, no fee.
Bolivia, installation fee $1.70, annual license $12.25.
Brazil, installation fee $2.40.
Chile, registration, no fee.
Belgium, installation fee, annual license.
Estonia, annual license $2.41 to $4.02.
Finland, annual license $2.50.
France, annual license, $0.40.

Netherlands, registration, no fee.
Spain, annual license $0.75.
Hong Kong, annual license $2.20.
Iraq, annual license.
Palestine, annual license.
New Zealand, annual license $7.29.
Algeria, annual license $0.40.
Canary Islands, annual license $1.08 to $10.80.
French Equatorial Africa, annual license $0.40.
French Morocco, annual license $0.40.
Madagascar, annual license $0.40.
South West Africa, annual license $3.55 to $9.75.
Tunisia, annual license $0.80.

Importing and merchandising unrestricted; broadcasting and receiving restricted:
Bahamas, broadcasting prohibited, annual receiving license $1.22.
Panama, broadcasting prohibited, installation fee $2.50.
Peru, broadcasting Government monopoly, annual receiving license $4.
Austria, broadcasting monopoly, annual receiving license $3.36 to $10.08.
Bulgaria, broadcasting concessions, annual receiving license $1.44.
Czechoslovakia, broadcasting monopoly, annual receiving license $3.60.
Danzig, broadcasting prohibited,[1] annual receiving license $3.37.
Denmark, Government broadcasting monopoly, annual receiving license $2.68.
Germany, broadcasting limited to corporations using Government stations, annual receiving license $5.71.
Gibraltar, broadcasting prohibited, annual receiving license $2.43.
Greece, broadcasting prohibited, annual receiving license $6.50.
Italy, broadcasting monopoly, receiving license $3.95.
Latvia, broadcasting monopoly, annual license $0.46.
Lithuania, broadcasting monopoly, annual license $10.
Malta, broadcasting prohibited, annual license $2.43 to $5.20.
Norway, broadcasting concessions, annual license $5.36.
Poland, broadcasting monopoly, annual license $3.36.
Rumania, broadcasting monopoly, annual license $3.60.
Sweden, modified broadcasting monopoly, installation fee $10.72, annual license $2.68.
United Kingdom, broadcasting monopoly, annual license $2.43.
Turkey, broadcasting monopoly, annual license $44.
Hong Kong, broadcasting monopoly, annual license $2.20.
India, broadcasting monopoly, annual license $3.65.
Japan, broadcasting monopoly, annual license $5.98.
Australia, modified broadcasting monopoly, annual license $4.15 and $5.83.
New Zealand, modified broadcasting monopoly, annual license $7.29.
Union of South Africa, broadcasting monopoly, annual license $4.87 to $8.50.

INTERNATIONAL CALL LETTERS OF STATIONS

The service regulations of the international telegraphic conventions of 1912 and 1927 provide that call letters of stations in the international system must when feasible be formed of a group of three letters for land stations. This regulation was adopted at Washington in 1927, with the specification that it should be made effective in all cases by the end of the year 1929. The initial letters of the calls are to designate the nationality of the station, these being assigned according to the following statement. There is considerable variation from the assignments existing previous to the Washington conference.

CAA–CEZ	Chile.	CPA–CPZ	Bolivia.
CFA–CKZ	Canada.	CRA–CRZ	Portuguese colonies.
CLZ–CMZ	Cuba.	CSA–CUZ	Portugal.
CNA–CNZ	Morocco.	CVA–CVZ	Rumania.

[1] Station of German system operating near Danzig.

CWA–CXZ	Uruguay.	RAA–RQZ	Russia.
CZA–CZZ	Monaco.	RVA–RVZ	Persia.
D	Germany.	RXA–RXZ	Panama.
EAA–EHZ	Spain.	RYA–RYZ	Lithuania.
EIA–EIZ	Ireland.	SAA–SMZ	Sweden.
ELA–ELZ	Liberia.	SPA–SRZ	Poland.
ESA–ESZ	Estonia.	SUA–SUZ	Egypt.
ETA–ETZ	Ethiopia.	SVA–SZZ	Greece.
F	France, colonies, etc.	TAA–TCZ	Turkey.
G	United Kingdom.	TFA–TFZ	Iceland.
HAA–HAZ	Hungary.	TGA–TGZ	Guatemala.
HBA–HBZ	Switzerland.	TIA–TIZ	Costa Rica.
HCA–HCZ	Ecuador.	TSA–TSZ	Saar Basin.
HHA–HHZ	Haiti.	UHA–UHZ	Hedjaz.
HIA–HIZ	Dominican Republic.	UIA–UKZ	Netherland East Indies.
HJA–HKZ	Colombia.	ULA–ULZ	Luxemburg.
HRA–HRZ	Honduras.	UNA–UNZ	Yugoslavia.
HSA–HSZ	Siam.	UOA–UOZ	Austria.
I	Italy and colonies.	VAA–VGZ	Canada.
J	Japan.	VHA–VMZ	Australia.
K	United States.	VOA–VOZ	Newfoundland.
LAA–LNZ	Norway.	VPA–VSZ	British colonies, etc.
LOA–LVZ	Argentina.	VTA–VWZ	British India.
LZA–LZZ	Bulgaria.	W	United States.
M	United Kingdom.	XAA–XFZ	Mexico.
N	United States.	XGA–XUZ	China.
OAA–OBZ	Peru.	YAA–YAZ	Afghanistan.
OHA–OHZ	Finland.	YHA–YHZ	New Hebrides.
OKA–OKZ	Czechoslovakia.	YIA–YIZ	Iraq.
ONA–OTZ	Belgium and colonies.	YLA–YLZ	Latvia.
OUA–OZZ	Denmark.	YMA–YMZ	Danzig.
PAA–PIZ	Netherlands.	YNA–YNZ	Nicaragua.
PJA–PJZ	Curacao.	YSA–YSZ	Salvador.
PKA–POZ	Netherland East Indies.	YVA–YVZ	Venezuela.
PPA–PYZ	Brazil.	ZAA–ZAZ	Albania.
PZA–PZZ	Surinam.	ZKA–ZMZ	New Zealand.
Q	(Abbreviations).	ZPA–ZPZ	Paraguay.
		ZSA–ZUZ	Union of South Africa.

In addition to these assignments each country has available a full series of calls made up of letters and numbers, initial letters indicating the nationality being prefixed. Most countries have used calls out of this group for broadcasting stations. A few countries, notably Germany, do not assign call letters to broadcasting stations.

BROADCASTING SERVICE

Broadcasting service, with few exceptions, is available in every inhabited region of the world. One can now hear the latest news, popular music, as well as the opera and sports from such widely separated cities as Berlin, Tokyo, Johannesburg, Paris, Sydney, Pittsburgh, and many others, as easily as though such cities were but a few hundred miles distant. World-wide broadcasting is now a fact, developed beyond the point generally imagined by Americans and Europeans. Short-wave stations in these two continents are received throughout the world, though our own reception of the other—particularly southern—continents awaits the construction of appropriate transmitters.

The following list of foreign radio broadcasting stations includes all stations outside the United States and its possessions which transmit programs for popular reception on either broadcast or short-

wave lengths. This list is as complete as is possible to be obtained by the Bureau of Foreign and Domestic Commerce.

FOREIGN RADIO BROADCASTING STATIONS

NORTH AMERICA

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
CANADA				
Bowmanville, Ontario	OKGW	435	690	5,000
Brandon, Manitoba	CKX	556	540	500
Calgary, Alberta	CFAC-CNRC	435	690	500
Do	CFCN-CNRC	435	690	500
Do	CJCJ-CHCA	313	960	250
Charlottetown, Prince Edward Island	CFCY	313	960	30
Do	CHCK	248	1,210	50
Chatham, Ontario	CFCO	248	1,210	5
Chilliwack, British Columbia	CHWK	248	1,210	15
Cobalt, Ontario	CKMC	517	580	250
Edmonton, Alberta	CHMA	517	580	500
Do	CJCA-CNRE	517	580	500
Do	CKUA	500	600	500
Fleming, Saskatchewan	CJRW	248	1,210	50
Fredericton, New Brunswick	CFNB	323	930	500
Halifax, Nova Scotia	CHNS	341	880	50
Hamilton, Ontario	CHML	341	880	50
Do	CKOC	341	880	10
Do	CHCS	500	600	250
Iroquois Falls, Ontario	CFCH	268	1,120	15
Kamloops, British Columbia	CFJC	313	960	4,000
King, York County, Ontario	CFRB-CJBC	268	1,120	500
Kingston, Ontario	CFRC	268	1,120	50
Lethbridge, Alberta	CJOC	330	910	500
London, Ontario	CJGC-CNRL	25.6	11,711	2,000
Middlechurch, Manitoba	CJRX	268	1,120	50
Midland, Ontario	CKPR	476	630	500
Moncton, New Brunswick	CNRA	291	1,030	1,650
Montreal, Quebec	CFCF	411	730	500
Do	CHYC	297	1,010	50
Montreal, Quebec (St. Hyacinthe)	CKSH	411	730	5,000
Do	CKAC-CNRM	500	600	500
Moose Jaw, Saskatchewan	CJRM	337	890	100
Ottawa, Ontario	CKCO	500	600	500
Do	CNRO	313	960	500
Pilot Butte, Saskatchewan	CHWC-CFRC	297	1,010	50
Prescott, Ontario	CFLC	248	1,210	50
Preston, Ontario	CKPC	341	880	100
Quebec, Quebec	CHRC	341	880	22.5
Do	CKCI	341	880	50
Do	CKCV-CNRQ	357	840	1,000
Red Deer, Alberta	CKLC-CHCT	357	840	500
Do	CNRD	313	960	50
Regina, Saskatchewan	CKCK-CNRR-CJBR	337	890	500
St. John, New Burnswick	CFBO	330	910	250
Saskatoon, Saskatchewan	CFQC-CNRS	330	910	50
Do	CJHS	291	1,030	25
Sea Island, British Columbia	CJOR	268	1,120	50
Summerside, Prince Edward Island	CHGS	341	880	500
Sydney, Nova Scotia	CJCB	357	840	
Toronto, Ontario	CFCA-CKOW-CNRT			
Do	CKCL - CFCL - CJBC - CJSC	517	580	500
Do	CKNC-CJBC	517	580	500
Vancouver, British Columbia	CKCD-CHLS	411	730	50
Do	CKFC	411	730	50
Do	CKMO	411	730	50
Do	CKWX	411	730	100
Do	CNRV	291	1,030	500
Victoria, British Columbia	CFCT	476	630	500
Waterloo, Ontario	CKCR	297	1,010	50
Winnipeg, Manitoba	CJRX	25.6	11,710	2,000
Do	CKY-CNRW	385	780	5,000
Wolfville, Nova Scotia	CKIC	323	930	50
Yorkton, Saskatchewan	CJGX	476	630	500
COSTA RICA				
Heredia	TIC	30.8	9,734	7.5
San Jose		340	882	15

FOREIGN RADIO BROADCASTING STATIONS—Continued

NORTH AMERICA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
CUBA				
Camagüey	CMJA	225	1,332	50
Do	CMJC	227	1,321	15
Camajuani	CMHF	200	1,500	20
Cárdenas	CMGE	218	1,375	30
Ciego de Avila	CMJB	225	1,332	10
Do	CMJD	192	1,561	15
Cienfuegos	CMHA	260	1,154	200
Do	CM6DW	224	1,335	10
Cifuentes	CMHH	345	870	10
Colon	CMGA	360	834	300
Guanabacoa	CMCG	245	1,225	30
Do	CMCT	202	1,487	5
Guanajay	CMAA	275	1,090	30
Habana	CMBA	223	1,345	50
Do	CMBC	265	1,130	150
Do	CMBD	314	955	150
Do	CMBE	213	1,405	15
Do	CMBF	223	1,345	7.5
Do	CMBH	202	1,487	30
Do	CMBI	213	1,405	30
Do	CMBJ	233	1,285	15
Do	CMBL	202	1,487	15
Do	CMBN	213	1,405	30
Do	CMBP	202	1,487	15
Do	CMBR	213	1,405	15
Do	CMBS	380	790	150
Do	CMBT	280	1,070	150
Do	CMBX	245	1,225	15
Do	CMBZ	297	1,010	150
Do	CMC	355	845	500
Do	CMCA	245	1,225	100
Do	CMCC	280	1,070	150
Do	CMCD	223	1,345	15
Do	CMCE	233	1,285	100
Do	CMCF	333	900	250
Do	CMCN	345	1,225	100
Do	CMCQ	314	955	1,000
Do	CMCR	233	1,285	20
Do	CMCU	223	1,345	50
Do	CMCY	223	1,345	
Do	CMK	411	730	2,000
Do	CMQ	265	1,130	250
Do	CMW	500	600	1,000
Do	CMX	333	900	250
Marianao	CMBK	245	1,225	15
Do	CMBM	233	1,285	15
Do	CMBQ	233	1,285	50
Do	CMBW	297	1,010	150
Do	CMBY	213	1,405	100
Do	CMCM	202	1,497	15
Do	CMCO	454	660	50
Matanzas	CMGB	253	1,185	7.5
Do	CMGC	282	1,315	30
Do	CMGD	263	1,140	5
Do	CMGF	286	1,050	10
Pinar del Rio	CMAB	240	1,250	20
Sagua la Grande	CMHB	200	1,500	10
Santa Clara	CMHE	210	1,429	20
Do	CMHI	270	1,110	15
Santiago de Cuba	CMKA	205	1,450	20
Do	CMKB	250	1,200	15
Do	CMKC	230	1,364	150
Do	CMKD	273	1,100	40
Santiago de las Vegas	CM8AZ	240	1,250	50
Tuinucu	CMBG	280	1,070	150
	CMHC	379	790	500
DOMINICAN REPUBLIC				
Santo Domingo	HIX	448	669	1,000
GUATEMALA				
Guatemala	TGW	525	571	50
HAITI				
Port au Prince	HHK	326	290	1,080

FOREIGN RADIO BROADCASTING STATIONS—Continued

NORTH AMERICA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
HONDURAS				
Tegucigalpa	HRB	49.95	6,005	2,300
MEXICO				
Chihuahua	XFF	325	926	250
Ciudad Juarez	XEJ	350	857	100
Guadalajara	XEA	250	1,200	100
Jalapa	XFC	475	631	350
Merida	XEY	549	547	100
Mexico City	XEB	335	895	1,000
Do	XEK	300	1,000	100
Do	XEN	411	730	1,000
Do	XEO	305	984	100
Do	XER	280	1,071	100
Do	XEX	326	920	500
Do	XEW	385	780	5,000
Do	XEZ	510	588	500
Do	XFA	0–14 42–43 500–600		50
Do	XFD	33 27	9,086 11,100	50
Do	XFG	470	638	2,000
Do	XFX	342	880	500
Do	XFY	507	591	1,000
Do	XC51	44	6,814	
Monterrey	XEH	311	947	100
Do	XET			1,500
Morelia	XEL	300	1,000	100
Oaxaca	XEF	265	1,132	100
Puebla	XEE	312	961	
Reynosa	XED	312	961	10,000
Saltillo	XEL	275	1,090	10
Tampico	XEM	357	840	500
Do	XES	337	890	1,500
Toluca	XEC	225	1,333	50
Vera Cruz	XEU	375	800	50
NEWFOUNDLAND				
St. John's	8WMC	415	723	500
SALVADOR				
Salvador	RUS	452	663	500

SOUTH AMERICA

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
ARGENTINA				
Azul	E4	340	882	350
Bahia Blanca	D5	286	1,050	
Buenos Aires	B2	215	1,395	50
Do	C1	229	1,315	100
Do	C4	222	1,350	100
Do	LR1	380	789	500
Do	LR2	345	870	3,000
Do	LR3	316	949	1,000
Do	LR4	303	990	2,000
Do	LR5	362	828	2,000
Do	LR6	330	909	1,000
Do	LR7	400	750	1,250
Do	LR8	261	1,149	1,500
Do	LR9	291	1,030	2,000
Do	LS1	425	706	5,000
Do	LS2	252	1,190	1,000
Do	LS3	236	1,270	1,000
Do	LS4	270	1,112	1,000
Do	LS5	281	1,076	1,000
Do	LS6	210	1,428	1,000
Do	LS7	222	1,351	1,000
Do	LS8	244	1,230	100
Concordia	J2	226	1,330	400
Cordoba	H7	319	940	100
Do	I4	326	920	120

FOREIGN RADIO BROADCASTING STATIONS—Continued

SOUTH AMERICA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
ARGENTINA—continued				
La Plata	LT2	438	685	1,000
Mar del Plata	D4	213	1,410	100
Mendoza	LT4	395	760	500
Do	M4	282	1,052	10
Do	M5	242	1,239	40
Do	M6	348	862	10
Parana	J1	240	1,249	50
Rafaela	G4	233	1,287	560
Rosario	F5	219	1,369	100
Do	LT3	275	1,090	1,500
San Francisco	H8	217	1,381	35
San Luis	Q4	205	1,463	60
Santa Fe	F1	297	1,009	100
Do	F3	256	1,168	100
Tucuman	K4	313	956	250
Venado Tuerto	G5	357	840	250
Villaguay	J5	263	1,138	65
Villa Maria	I1	246	1,219	50
BOLIVIA				
La Paz	CPX	300	1,000	1,000
BRAZIL				
Amparo	PRAM			50
Bahia	PRAH	600	500	50
Do	SQBE	24	12,490	
Curityba	PRAN	380	789	8
Franca	PRAZ			50
Juiz de Fora	PRAJ	380	789	200
Manaos		100	2,998	1,500
Mogy das Cruzes	PRAY	298	1,006	50
Para		34	8,818	
Pelotas	PRAD			
Pernambuco	PRAP	310	967	300
Porto Alegre	PRAG	250	1,199	500
Ribeirao Preto	PRAI	350	857	50
Rio de Janeiro	PRAA	400	750	1,000
Do	PRAB	320	937	500
Do	PRAC	260	1,153	500
Do	PRAD	350	857	500
Santos	PRAS	420	714	50
Sao Paulo	PRAE	360	833	1,000
Do	PRAL	400	750	100
Do	PRAO	225	1,330	1,000
Do	PRAR	280	1,071	500
Sorocaba		425	706	
BRITISH GUIANA				
Georgetown	VRY	43.86	6,832	8
CHILE				
Santiago	CMAB	480	625	1,000
Do	CMAC	373	804	1,000
Do	CMAK	225	1,333	100
Do	CMAO	295	1,016	250
Do	CMAQ	245	1,224	100
Valparaiso	CMAJ	290	1,034	100
COLOMBIA				
Bogota	HJN	425	706	550
Do	HKF	39	7,688	50
PARAGUAY				
Asuncion				12
PERU				
Arequipa	OA6U	170	1,764	20
Lima	OAX	380	789	1,500
Do	OA4M	210	1,428	12

FOREIGN RADIO BROADCASTING STATIONS—Continued

SOUTH AMERICA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
URUGUAY				
Montevideo	CX6	462	650	1,000
Do	CX10	411	730	1,000
Do	CX12	390	770	500
Do	CX14	370	810	1,000
Do	CX18	337	890	250
Do	CX20	323	930	2,000
Do	CX22	309	970	250
Do	CX24	297	1,010	1,000
Do	CX26	286	1,050	2,000
Do	CX30	266	1,130	250
Do	CX32	256	1,170	200
Do	CX36	240	1,250	250
Do	CX38	233	1,290	100
Do	CX40	226	1,330	100
Do	CX42	219	1,370	500
Do	CX44	213	1,410	20
Do	CX46	207	1,450	100
Do	CX48	201	1,490	50
Do	CX34	248	1,210	500
Salto	CW32	254	1,180	50
Do	CW34	246	1,220	50
Do	CW36	238	1,260	30
Do		231	1,300	30
Paysandu	CW40	224	1,340	30
Do	CW44	211	1,420	30
Tucuarembo	CW46	206	1,460	20

EUROPE

ALBANIA				
Tirana				300
AUSTRIA				
Graz		353	851	7,000
Innsbruck		284	1,058	500
Klagenfurt		453	662	500
Linz		246	1,220	500
Vienna	UON2	49.4	6,073	20
Do		516	581	15,000
BELGIUM				
Andritmont	ON4EX	216	1,388	100
Antwerp	ON4ED	206	1,455	50
Brussels	ON4GT	219	1,372	100
Do	ON4RB	509	5,894	1,500
Do	ON4RC	207	1,448	100
Do	ON4FO	246	1,219	100
Chatelineau	ON4CE	216	1,388	200
Dampremy	ON4FG	206	1,459	25
Ghent	ON4RG	246	1,219	400
Liege	ON4RW	246	1,219	200
Verviers	ON4CF	206	1,459	100
CZECHOSLOVAKIA				
Bratislava	OKR	279	1,075	12,500
Brunn	OKB	342	877	2,500
Kosice	OKK	293	1,023	2,500
Prague	OKP	487	616	5,000
Do	OK1MP1	58	5,169	5,000
DANZIG				
Danzig	PTB	453	662	250
DENMARK				
Copenhagen		281	1,067	1,000
Kalundborg		1,153	260	7,500
Lyngby		19.6	15,300	
		31.6	9,488	
Soro		49.5	6,057	500
		971	3,088	

FOREIGN RADIO BROADCASTING STATIONS—Continued

EUROPE—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
ESTONIA				
Tallinn		296	1,013	10,000
Do		1,200	250	100
Tartu (Dorpat)		408	735	2,200
FINLAND				
Abo		246	1,220	
Bjorneborg (Pori)		246	1,220	1,500
Helsingfors (Helsinki)		221	1,355	10,000
Jakobstad (Pietarsaari)		246	1,220	750
Lahtis		1,796	167	40,000
Tammerfors (Tampere)				700
Viborg (Vipuri)		291	1,030	750
FRANCE				
Agen	F2BD	312	961	480
		30.75	9,761	
Angers		275	1,091	250
Beziers		220	1,364	1,500
Biarritz		198	1,515	250
Bordeaux		250	1,200	5,000
Do		304	986	1,500
Caen		278	1,080	200
Grenoble		328	914	1,500
Juan-les-Pins		248	1,219	250
Lille		265	1,132	500
Limoges		293	1,022	500
Lyon	YN	466	643	3,000
Do	YR	291	1,029	500
		40.2	7,463	
Marsan		400	750	250
Marseille		316	949	500
Montpellier		286	1,049	200
Nancy		15.5	19,355	
Nimes		240	1,250	500
Nogent-sur-Seine	F8AV	80	3,750	
Paris	FL	32	9,375	15,000
		1,446	207	
		2,650	113	
Do	FPTT	448	671	1,000
Do	F8GC	368	815	1,500
		61	4,915	
Do		331	905	500
Do		1,725	174	13,500
Do		310	968	2,000
		41	7,317	
Rennes		272	1,103	1,500
Rheims		386	777	500
St. Etienne		220	1,364	250
Toulon		250	1,200	500
Toulouse	MRD	225	1,175	1,500
Do		381	770	8,000
GERMANY				
Aachen		227	1,319	300
Augsburg		559	536	300
Berlin		419	716	1,700
Do		1,635	184	35,000
Do		284	1,058	600
Bremen		316	950	300
Breslau		325	923	1,700
Cologne		227	1,319	1,700
Dresden		319	941	300
Flensburg		219	1,373	600
Frankfort on the Main		390	770	1,700
Freiburg		569	527	300
Gleiwitz		259	1,157	5,600
Hamburg		372	806	1,700
Hanover		566	530	300
Kaiserslautern		270	1,112	300
Kassel		246	1,220	300
Kiel		232	1,292	300
Konigsberg		277	1,085	1,700
Langenberg		473	635	17,000
Leipzig		253	1,184	2,300

FOREIGN RADIO BROADCASTING STATIONS—Continued

EUROPE—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
GERMANY—continued				
Magdeburg		284	1,058	600
Muenster		227	1,319	600
Munich		533	563	1,700
Nuremberg		239	1,256	2,300
Stettin		284	1,058	600
Stuttgart		360	833	1,700
Zeesen		31.38	9,560	30,000
HUNGARY				
Budapest		550	545	20,000
ICELAND				
Akureyri	G2SH	192	1,560	
Reykjavik		333	8,995	500
IRISH FREE STATE				
Cork	6CK	224	1,337	1,000
Dublin	2RN	413	726	1,500
ITALY				
Bolzano	IBZ	453	662	200
Genoa (Genova)	IGE	385	779	1,200
Milan (Milano)	IMI	50	599	7,000
Naples (Napoli)	INA	331	905	1,500
Rome (Roma)	IRO	441	680	3,000
Do	IIAX	45	6,663	
Turin (Torino)	ITO	272	1,031	7,000
LATVIA				
Riga	YLZ	525	571	10,000
LITHUANIA				
Kovno	RYK	1,935	155	7,000
LUXEMBURG				
Luxemburg	LOAA	223	1,344	10,000
NETHERLANDS				
Hilversum	PBF1	1,071	280	7,000
Huizen	PH1	16.9	17,778	40,000
Do	PH9	298	1,006	6,200
		1,875	160	
Scheveningen	PCF	1,071	280	1,500
NORWAY				
Aalesund	LKA	447	671	350
Bergen	LKB	364	824	1,000
Do	LGN	30	9,994	
Fredrikstad	LKF	385	779	700
Hamar	LKH	570	526	700
Notodden	LKN	447	671	50
Oslo	LKO	493	608	60,000
Porsgrund	LKP	453	662	700
Rjukan	LKR	447	671	
Tromsoe	LKM	453	662	100
Trondhjem		244	1,229	1,000
POLAND				
Katowice		409	734	10,000
Krakow		313	959	1,500
Poznan		335	896	1,500
Warsaw		1,412	203	12,000
Wilna		385	779	500
PORTUGAL				
Lisbon	CT1AA	319	942	1,000
RUMANIA				
Bucharest		394	759	12,000

FOREIGN RADIO BROADCASTING STATIONS—Continued

EUROPE—Continued

City	Call	Wave length in meters	Frequency, in kilocycles	Power, in watts
SPAIN				
Almeria	EAJ18	261	1,195	200
Barcelona	EAJ1	349	855	7,500
Do	EAJ13	268	1,119	10,000
Cartagena	EAJ15	246	1,219	100
Madrid	EAJ2	400	750	750
Do	EAJ7	424	708	1,500
Do	EAM	30.7	9,772	
Oviedo	EAJ19	368	815	30
San Sebastian	EAJ5	368	809	1,000
Seville		368	809	
SWEDEN				
Boden	SBE	1,200	250	600
Boras	SCA	229	1,309	1,500
Eskilstuna	SCB	246	1,219	200
Falun	SCC	322	931	500
Gavle	SCD	204	1,470	200
Goteborg	SBB	322	931	10,000
Halmstad	SCE	216	1,390	200
Helsingborg	SCG	231	1,298	200
Horby	SBH	257	1,167	10,000
Hudiksvall	SCF	270	1,110	150
Jonkoping	SCH	202	1,484	250
Kalmar	SCI	246	1,219	200
Karlsborg	SAS	25.5	11,760	
Karlskrona	SCJ	196	1,530	250
Karlstad	SCK	218	1,375	250
Kiruna	SCL	246	1,219	200
Kristinhamn	SCM	203	1,481	250
Malmberget	SCN	436	6,877	250
Malmo	SBC	231	1,298	600
Motala	SBG	1,348	222	30,000
Norrkoping	SCO	270	1,110	260
Orebro	SCV	237	1,265	200
Ormskoeldsvik	SCW	218	1,375	200
Ostersund	SBF	770	400	600
Saffle	SCP	246	1,219	400
Stockholm	SBA	436	688	1,000
Sundsvall	SBD	542	553	600
Trollhattan	SCQ	266	1,129	250
Uddevalla	SCR	286	1,050	50
Umea	SCS	231	1,298	200
Uppsala	SCT	453	662	150
Varberg	SCU	283	1,059	300
SWITZERLAND				
Basel		1,010	297	250
Berne		403	743	1,000
		32	9,375	
Geneva		760	395	250
Lausanne		680	441	600
Zurich	H9XD	85	3,529	
		32	9,375	
Do		459	653	630
UNITED KINGDOM				
Aberdeen	2BD	302	994	1,000
Belfast	2BE	242	124	1,000
Bournemouth	6BM	289	1,039	1,000
Cardiff	5WA	310	967	1,000
Caterham	2NM	32.5	9,225	
Daventry	5XX	1,554	193	25,000
Do	5GB	479	626	25,000
Dundee	2DE	289	1,039	130
Edinburgh	2EH	289	1,039	330
Glasgow	5SC	399	751	1,000
Hull	6KH	289	1,039	130
Leeds and Bradford	2LS	200	1,499	130
		289	1,039	
Liverpool	6LV	289	1,039	130
London	2LO	356	841	30,000
		261	1,149	
Manchester	2ZY	376	816	1,000
Newcastle	5NO	261	1,147	1,000

FOREIGN RADIO BROADCASTING STATIONS—Continued

EUROPE—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
UNITED KINGDOM—continued				
Plymouth	5PY	289	1,039	130
Sheffield	6FL	289	1,039	130
Stoke-on-Trent	6ST	289	1,039	130
Swansea	5SX	289	1,039	130
YUGOSLAVIA				
Belgrade		432	695	2,500
Ljubljana		569	527	3,000
Zagreb		307	977	700
SOVIET RUSSIA				
Armavir	RA47	720	416	200
Artemovsk	RA56	790	380	1,200
Astrakhan	RA26	700	428	1,000
Baku	RA45	750	400	4,000
Bogorodsk	RA8	750	400	700
Dneipropetrovsk	RA30	525	571	1,000
Erivan	RA49	1,050	286	1,200
Gomel	RA39	925	324	1,200
Irkutsk	RA57	1,100	273	500
Ivanovo-Vosnessensk	RA7	800	375	180
Kharkov	RA43	477	629	4,000
		1,700	176	
Kiev	RA5	755	397	1,200
Koursk	RA34	575	521	1,000
Krasnodar	RA38	513	584	1,000
Leningrad	RA42	1,000	300	10,000
Do	RA51	150	1,999	350
Minsk	RA18	860	349	1,200
Moscow	RA1	1,450	207	40,000
Do	RA2	450	666	500
Do	RA4	450	666	300
Nalchik	RA67	1,075	279	1,200
Nizhni-Novgorod	RA13	840	357	1,800
Novorossisk	RA33	1,117	268	4,000
Odessa	RA40	975	308	1,200
Orenburg	RA25	640	469	1,000
Petrapavlovsk	RA64	350	857	45
Petrozavodsk	RA46	765	392	2,000
Rostov-on-Don	RA14	820	366	4,000
Samara	RA22	900	333	1,200
Saratov	RA32	420	714	200
Sevastopol	RA9	800	375	250
Smolensk	RA68	330	909	20
Do	RA72	150	1,999	800
Stalino	RA77	730	411	1,200
Stavropol	RA20	550	545	1,200
Sverdlovsk	RA15	1,050	286	500
Tashkent	RA27	715	419	2,000
Tiflis	RA11	870	345	4,000
Tomsk	RA21	300	999	150
Tver	RA44	690	435	1,200
Ulyanovsk	RA51	500	600	20
Vel Ustjuk	RA16	650	461	1,200
Vladivostock	RA17	480	625	1,500
Vologda	RA41	875	343	1,200
Voronezh	RA12	950	316	1,200

ASIA

TURKEY				
Angora		1,600	187	5,000
Osmanie		1,200	250	6,000
BRITISH MALAYA				
Singapore	VS1AB	41.3	7,260	
Johore	VS3AB	42.5	7,055	
CEYLON				
Colombo		800	375	1,750

FOREIGN RADIO BROADCASTING STATIONS—Continued

ASIA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
CHINA				
Canton	CAB	435	689	1,000
Hangchow	XGY	335	895	250
Harbin	COHB	445	674	1,000
Mukden	COMK	420	714	2,000
Nanking	XGZ	485	606	500
Peking	COPK	320	937	1,000
Shanghai	NKS	310	967	50
Do	KRC	338	887	250
Do	KSMS	277	1,082	50
Do	RSC	235	1,276	50
Do	SSC	280	1,071	50
Do	XAH	240	1,240	50
Tientsin	CRC	280	1,071	500
Do	COTN	480	625	500
CHOSEN				
Seoul	JODK	435	690	1,000
FRENCH INDO-CHINA				
Haiphong		87	3,446	2,500
HONG KONG				
Victoria Peak	ZBW	350	857	1,500
INDIA				
Bombay	VUB	357	840	3,000
Calcutta	VUC	370	810	3,000
JAPAN				
Hirasio	JHBB	37.5	7,995	
Hiroshima	JOFK	353	849	10,000
Kumamoto	JOGK	380	789	10,000
Nagoya	JOCK	370	810	10,000
Osaka	JOBK	400	750	10,000
Sapporo	JOIK	361	831	10,000
Sendai	JOHK	390	769	10,000
Taihoku	JFAK	850	353	1,000
Taipeh	JFAB	39.5	7,590	
Tokyo	JOAK	345	869	10,000
KWANTUNG				
Dairen	JQAK	395	759	500
NETHERLAND EAST INDIES				
Bandoeng	PLE	15.93	18,860	30
		31.86	9,410	
Do	IBR	58	5,170	1,000
Batavia	PK1AA	75	3,998	500
Djokjakarta	PK2AF	50	5,996	500
Macassar	PK6KZ	41	7,313	500
Malabar	PLF	17	17,640	
Palembang	PK4PA	5	59,964	240
Semarang	PK2AG			
Surabaya	PK3CH	45	6,662	250
Do		140	2,142	500
AUSTRALIA				
Adelaide	5CL	409	733	2,500
Do	5DN	313	958	250
Do	5KA	250	1,199	500
Do	5AD			
Ballarat	3BA			
Bathurst	2MK	260	1,153	125
Brisbane	4QG	385	779	2,500
Hobart	7ZL	516	581	1,500
Melbourne	3AR	484	620	2,500
Do	3DB	255	1,176	250
Do	3LO	32	9,369	2,500
		371	808	
Do	3UZ	319	940	50
Newcastle	2HD	288	1,041	50
Perth	6WF	435	689	2,500

FOREIGN RADIO BROADCASTING STATIONS—Continued

ASIA—Continued

City	Call	Wave length, in meters	Frequency, in kilocycles	Power, in watts
AUSTRALIA—continued				
Sydney	2BL	32.5	9,225	2,500
		353	849	
Do	2FC	28.5	10,520	2,500
		451	665	
Do	2GB	316	949	1,500
Do	2KY	280	1,071	750
Do	2ME	28.5	10,520	
Do	2UE	293	1,023	125
Do	2UW	267	1,123	250
FIJI ISLANDS				
Suva		Short.	High.	
NEW ZEALAND				
Auckland	1YA	333	900	500
Do	1ZB	275	1,089	15
Do	1ZQ	252	1,188	
Christchurch	3YA	306	980	500
Do	3ZC	50	5,996	250
		250	1,199	
Dunedin	4YA	462	648	500
Do	4ZH	278	1,078	20
Do	4ZL	246	1,219	35
Do	4ZM	278	1,078	17
Do	4ZO	278	1,078	7
Eketahuna	2ZE	248	1,209	5
Gisborne	2ZM	261	1,147	160
Masterton	2ZD	254	1,180	2.5
Do	2ZQ	254	1,186	10
Napier	2ZH	238	1,260	15
New Plymouth	2YB	244	1,229	100
Palmerston	2ZF	286	1,049	150
Wanganui	2ZG	500	600	7.5
Do	2ZK	500	600	7.5
Wellington	2YA	417	718	5,000

AFRICA

ALGERIA				
Algiers		364	824	2,400
CANARY ISLANDS				
Las Palmas	EAR5	280	1,071	500
EGYPT				
Cairo		342	869	
Do		330	909	
KENYA				
Nairobi	7LO	31.1	9,600	2,000
		400	750	
MOROCCO				
Casablanca	AIN	51	5,879	
Do	CNO	305	983	25
Rabat		43.6	6,877	2,500
		414	724	
TUNISIA				
Carthage	TNU	1,850	162	
Constantine	8KR	42.8	7,005	
Tunis	TUA	1,250	240	500
UNION OF SOUTH AFRICA				
Cape Town	ZTC	375	800	1,000
Durban	ZTD	407	789	1,000
Johannesburg	ZTJ	32	9,369	15,000
		444	676	

Revised lists of foreign broadcasting stations are issued by the electrical equipment division of the Bureau of Foreign and Domestic Commerce in mimeographed form whenever changes and additions warrant the revision. There is no charge for such lists, which will be sent to any American firm or individual requesting them.

THE FINANCING OF BROADCASTING

The cost of broadcasting may be borne by the broadcaster who uses radio as a good-will adjunct to another business or operates radio as an avocation; it may be borne by an advertiser or advertisers through fees for direct advertisements; it may be paid by the listeners through any of the multifarious systems previously indicated; or it may be provided through some form of government subsidy. The methods of radio financing, while of prime importance in understanding the character of the market, do not in themselves have more than a superficial effect on the volume of sales. The question of paying the costs of broadcasting requires early attention in setting up a broadcasting system. The importance of this question is readily recognized when it is remembered that a system once adopted can not be discarded without trouble.

Where the costs fall upon the broadcaster, as return for his efforts and expense, he is granted the limited use of a given channel for broadcasting commercial publicity in connection with programs, either for himself or for a paying clientele. Few countries permit advertising of a commercial nature; in those which do not, the cost is placed on the government or the listener.

Radio administration divides advertising into two classes. These have been termed "direct" and "indirect," although the terms are no longer descriptive of the methods. Direct advertising is arranged by the sale of a limited amount of the station's time, usually 5 minutes out of each hour, during which period there is no restraint upon the advertising broadcast. The remaining 55 minutes are devoted to program material designed to entertain the listener. Under the alternative method the station sells the entire hour, the advertiser furnishing the program. Between numbers, advertising matter is given, to whatever extent the advertiser believes most effective. (To offset lengthy advertising talks a recently announced device will silence a set for whatever period a beam of light is directed upon a photoelectric cell, a flashlight being suggested.)

Another source of revenue is the government. The methods by which it may be interested in broadcast financing are numerous. It may be and often is the owner of one or more, or all, of the broadcasting stations in a country. If there is no provision for receiving licenses, these stations are operated entirely on public funds. If there is a licensing system, some income accrues to the stations, deficits or surpluses usually being liquidated from the general treasury. Few governments contribute toward the support of broadcasting stations not owned by them.

Receiving licenses have been adopted by most countries as a means of financing broadcasting. The licensing idea takes many different forms, and the fees are collected in many ways.

In several instances licenses are required only for statistical purposes, the revenue being utilized to defray a part of the cost of issuing licenses and apprehending operators of unlicensed sets.

The license fee is usually an annual charge but may be collected monthly, quarterly, or semiannually, either by the government or by the broadcaster. Subscription fees differ from license fees only

in that the collection is invariably made by the broadcaster. In most countries the governments retain or collect appreciable portions of license fees to defray the cost of their connected activities and of necessary police expenses, the broadcasters receiving the remainder. An installation fee is sometimes collected. This fee is ordinarily a strictly government collection and is the only charge made in several countries.

The following table shows the license and other fees charged in various countries for receiving sets.

LICENSE AND OTHER RECEIVING-SET FEES

[Amounts converted to United States dollars at current exchange]

Country	Inspection and installation fees	Annual license fee	Annual broadcasting subscription	Total	
				First year	Subsequent years
Bahamas		$1.22		$1.22	$1.22
Barbados		(1)			
Bermudas		(1)			
British Honduras		5.00		5.00	5.00
Canada		1.00		1.00	1.00
Guatemala	$5.00			5.00	
Trinidad and Tobago		[2] 2.43–4.87		2.43–4.87	2.43–4.87
Bolivia	1.70	12.28		13.98	12.28
Brazil	2.40			2.40	
Peru		4.00		4.00	4.00
Venezuela		11.58		11.58	11.58
Austria		[3] 3.39–10.16		3.39–10.16	3.39–10.16
Belgium	(1)	(1) (2)			
Bulgaria		1.44		1.44	1.44
Czechoslovakia			$3.60	[4] 3.30	3.60
Danzig		3.37		3.37	3.37
Denmark		2.68		2.68	2.68
Estonia		[2] 2.40–4.00		2.40–4.00	2.40–4.00
Finland		2.00		2.00	2.00
France		.39		.39	.39
Germany		5.71		5.71	5.71
Gibraltar		2.43		2.43	2.43
Greece		6.50		6.50	6.50
Hungary		5.40		5.40	5.40
Irish Free State		2.43		2.43	2.43
Italy		.15	3.80	3.95	3.95
Latvia		4.83		4.83	4.83
Lithuania		10.00	1.20–6.00	11.20–16.00	11.20–16.00
Malta	2.67	2.43		5.10	2.43
Norway		5.36		5.36	5.36
Poland		3.36		3.36	3.36
Rumania			3.60	3.60	3.60
Spain		.97		.97	.97
Sweden	10.72	2.68		13.40	2.68
Switzerland	.60	3.00		3.60	3.00
United Kingdom		2.43		2.43	2.43
Yugoslavia		3.96		3.96	3.96
Turkey		44.00		44.00	44.00
Hong Kong		2.20		2.20	2.20
India		3.65		3.65	3.65
Japan (including Chosen and Kwantung)		.50	5.97	6.47	6.47
Syria	.96			.96	
Australia		[5] 4.25–5.84		4.25–5.84	4.25–5.84
New Zealand		7.29		7.29	7.29
Canary Islands		.97		.97	.97
Tunisia		.78		.78	.78
Union of South Africa		[5] 4.87–8.52	[5] 4.87–8.52	[5] 4.87–8.52	[5] 4.87–8.52

[1] Required; no data as to cost.
[2] Depending on number of tubes.
[3] Depending on income of owner.
[4] No charge for first 30 days to permit demonstration without penalty.
[5] Depending on distance from main station.

WORLD MARKET CONDITIONS

GEOGRAPHIC FACTORS IN RADIO MARKETING

Among most important factors to be considered in judging the world radio markets are geography, geology, and climate. Of little importance in general marketing, except as transportation may be affected, these factors are of exceptional interest in determining the possibilities of radio reception.

There may be such spottiness in reception that a major degree of difference results in the moving of a set, even to another house in the same neighborhood. Where only a few sets are in operation, the experience in operating them can not give a good basis for judging reception unless the particular situations are identically balanced at the average point for the entire area they are intended to represent. On the other hand, experience is the only guide to the quality of reception. Radio engineering has not yet reached the point where it is possible to state with certainty what results a given type of broadcasting station will give on a particular power or wave length in a chosen place until it has been tried. Thorough and precise analysis of climatic, geological, and other natural factors is impossible because of the lack of sufficient detailed basic information as to how each character might affect the transmission of radio waves. But general data may be accepted as having a reasonable amount of value in making a broad judgment.

The natural conditions as given in this publication are for the most part taken from encyclopedic works privately published, which have been checked with such official information as is available.

Climatic conditions have a deteriorating effect on many radio parts. This is particularly true as regards metals and insulating materials. Certain types of batteries are also prone to develop faults quickly in some climates. Exporters should make a study of the materials employed in their products with a view to determining their suitability for use in the countries where such difficulties are experienced. In some instances changes in receivers would probably increase their marketability. In hot countries with high humidity, insulation and plates for condensers must be of particular qualities to avoid early and inevitable failure.

WAVE LENGTHS USED ABROAD

Sets limited to reception only within the 200–545 meter wave band are completely satisfactory for any part of the Western Hemisphere, but those to be employed elsewhere, particularly Europe, must be capable of receiving on the higher wave lengths in use there. A large number of stations employ waves between 1,340 and 1,875 meters, the higher of the two bands approved by the Washington conference. Sets not capable of covering both these bands are not in demand in such places. The limitation is actually a disability, even greater than that which would maintain in the United States toward a set that received only on wave lengths of from 200 to 300 meters. The stations on this higher band are almost without exception selected stations of high power, broadcasting the highest type of programs.

Short waves continue to show a significant advance in popularity. With modern short-wave sets and adapters for broadcast receivers distant reception has become more important. Evidence of this fact is presented by the demand for long-range sets and the almost total disappearance of demand for strictly local receivers.

CHANGES IN MARKET CONDITIONS

Radio markets are constantly changing, and radio apparatus is one of the first commodities to respond to any important change in economic conditions. The wide range of initial costs brings appropriate radio equipment within the reach of nearly everyone, and any change in the purchasing power of any class is soon reflected in change in the demand for radio sets. An attempt has been made to indicate in this publication, so far as possible, the character of each market under a normal condition of prosperity, eliminating consideration of transitory developments.

The market conditions are being reported constantly by consular officers of the Department of State and representatives of the Department of Commerce stationed in foreign countries, and these reports are published in various ways. This information is highly "perishable" and will be found in Commerce Reports, the weekly foreign trade journal of the Department of Commerce, and in Electrical Foreign Trade Notes, a mimeographed circular issued weekly.

COMPARISON OF MARKETS

Radio markets are as yet incapable of accurate measurement. The diversity of the conditions affecting the demand and variations of the importance of each condition are responsible for this. Such matters include climate, tastes and desires of the people, religion, the form of government, educational opportunities and standards, business methods, wealth, density of population, races, standards of living, availability of broadcasting, language, recreational activities, and other such factors. Few of these conditions can be precisely defined, much less mathematically evaluated, but any one or a combination of them may determine the position of the decimal point in transacting radio business. Statistics covering a few of these factors are available for only a few countries. Where they agree between countries as to the matters covered they are seldom to be found parallel in regard to important definitions.

United States export figures, though not entering into any precise definition of market absorption, have proved a valuable guide for judging this elusive factor. Estimates comparing markets, when based on these statistics are for all practical purposes a correct valuation for market analyses.

Requests are often made for foreign import and export statistics, to be used in conjunction with American figures. While all countries collect and publish them, the matter of classification often precludes their use. Only the United States divides radio equipment into several classes. Two or three other countries have radio accounted separately, while all others group these goods with other kinds so broadly that all statistical value is lost, sometimes as "scientific instruments," sometimes as "electrotechnical goods," sometimes

in a single group for "electrical equipment," sometimes with "telephone and telegraph equipment," and in a few cases, with other electrical goods as "machinery." From such data nothing of value to the radio exporter can be abstracted.

AMERICAN EXPORTS OF RADIO EQUIPMENT

Comparing the last two calendar years (1928–1929) with 1925, the previous peak year in radio exporting, 12 markets stand out as being consistently best, appearing among the first 15 in all three years. Canada ranks first, with notable yearly increases; Japan was second in 1925, eighth in 1928 with a considerable loss in value, and fifteenth in 1929 with a small increase. Argentina, fifth in 1925, almost quadrupled its purchases in 1928 to attain second place, and with a further slight increase maintained that position in 1929. Australia with consistent increases, held third place all three years. The United Kingdom, in fourth, fourth, and eighth places, respectively, dropped off about one-fifth in 1928, but in 1929 nearly equalled the 1928 total.

Italy has increased its purchases spectacularly, not appearing among the first fifteen in 1925, but ranking sixth in 1928, and fourth in 1929 by tripling the 1928 purchases. Brazil ranked sixth, fifth, and ninth with moderate increases, and Mexico seventh and tenth in 1925 and 1928 with a slight loss, but fifth in 1929 with more than four times the 1928 figure. New Zealand, thirteenth, seventh, and sixth, shows large increases, as does Cuba, fourteenth, eleventh, and seventh. Spain eighth, thirteenth, and twelfth, shows erratic tendencies, with an appreciable decrease followed by a large increase. The Netherlands, ninth in 1925, dropped to twelfth and thirteenth, but the money value increased each year. The Philippine Islands dropped from twelfth to fifteenth in 1928, was fourteenth in 1929. but increased purchases considerably both years. A tabulation of these markets showing the years considered follows:

UNITED STATES EXPORTS OF RADIO EQUIPMENT TO LEADING COUNTRIES IN 1928 AND 1929, COMPARED WITH 1925

Rank	1925		1928		1929	
	Country	Value	Country	Value	Country	Value
1	Canada	$3,682,929	Canada	$5,264,642	Canada	$10,784,156
2	Japan	2,216,535	Argentina	1,513,693	Argentina	1,775,531
3	Australia	675,483	Australia	1,179,450	Australia	1,541,876
4	United Kingdom	644,916	United Kingdom	460,003	Italy	1,145,376
5	Argentina	408,593	Brazil	432,524	Mexico	1,041,288
6	Brazil	358,156	Italy	337,285	New Zealand	699,736
7	Mexico	272,135	New Zealand	286,771	Cuba	658,038
8	Spain	230,265	Japan	267,253	United Kingdom	631,186
9	Netherlands	138,695	Uruguay	244,309	Brazil	550,037
10	Sweden	122,451	Mexico	224,255	Russia in Europe	414,762
11	Chile	113,671	Cuba	222,391	China	412,694
12	Philippine Islands	109,030	Netherlands	209,199	Spain	366,763
13	New Zealand	98,265	Spain	171,325	Netherlands	307,452
14	Cuba	84,087	China	127,913	Philippine Islands	297,107
15	Czechoslovakia	71,813	Philippine Islands	120,337	Japan	282,175

During the last four years, during which United States radio exports have been divided into five classes, our exports to foreign countries have been as follows:

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS

Country of destination	1926	1927	1928	1929
TRANSMITTING SETS AND PARTS				
Austria				$2,412
Belgium	$9,222	$317		399
Bulgaria				66
Czechoslovakia		475	$807	5,198
Denmark	33			7,806
Estonia				122
France	1,902	329	287	2,451
Germany	1,144	8,932	32,238	12,553
Greece				18
Hungary				68
Italy	50,152	3,119	8,087	154,481
Latvia				327
Netherlands	423	220	1,618	6,447
Norway	59			350
Poland and Danzig		1,744	5,896	4,720
Portugal		70		539
Rumania				34
Russia in Europe	9,429	5,745	1,318	355,751
Spain	156	4,349	1,098	41,010
Sweden	260	106	381	
United Kingdom	8,647	34,499	26,403	8,097
Canada	15,263	30,141	255,434	380,396
British Honduras	38	500	12	
Costa Rica		411	4,337	3,202
Guatemala	26		75	2,913
Honduras	21,220	21,545	34	5,204
Nicaragua	250	196	281	1,820
Panama	520	1,825	3,195	18,220
Salvador	60		15	1,457
Mexico	21,293	3,523	8,377	21,218
Newfoundland and Labrador	480	174	360	2,097
Barbados		13		93
Jamaica	50		159	
Trinidad and Tobago	124			180
Other British West Indies		568	676	1,275
Cuba	3,277	21,877	13,825	28,685
Dominican Republic	896	29,011	25,426	1,794
Netherland West Indies		853	117	650
Haiti	22,427			6,298
Virgin Islands				120
Argentina	75,826	51,014	99,454	208,372
Bolivia			4,660	316
Brazil	11,405	18,271	101,420	86,143
Chile	13,136	2,172	216	10,628
Colombia		14,060	24,100	8,667
Ecuador		39	1,000	
Peru		100	38	2,271
Uruguay	15,203	26,131	1,108	3,646
Venezuela	13,368	2,932	8,945	22,382
British India	365		19	
British Malaya	15	23		81
Ceylon			78	
China	2,459	34,262	47,239	235,063
Netherland East Indies			5,845	60,553
Hong Kong	84		2,174	626
Japan	163,317	55,874	41,053	43,359
Kwantung				186
Philippine Islands	7,609	15,142	24,859	168,345
Siam			8,975	50
Russia in Asia	60,657			
Australia	5,608	3,995	6,244	9,616
British Oceania			22	
French Oceania	259	72		7
New Zealand	18,975	2,496	700	1,461
British South Africa		67		21
Egypt				73
Liberia		3,905		157
Mozambique			33	
Total	555,640	401,109	768,728	1,940,483
RECEIVING SETS				
Austria	1,786	209	817	2,128
Azores and Madeira Islands	75	52	51	788
Belgium	1,995	1,103	2,015	5,079
Bulgaria		1,285	464	948
Czechoslovakia	1,524	2,802	8,177	10,671
Denmark	15,818	13,872	8,466	1,475
Estonia	180	1,471	485	254
Finland	4,046	5,232	6,095	1,168

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS—Continued

Country of destination	1926	1927	1928	1929
RECEIVING SETS—continued				
France	$6,158	$4,841	$4,990	$23,250
Germany	5,892	6,833	7,147	8,330
Gibraltar			45	50
Greece	785	3,064	1,177	1,184
Hungary	170		543	217
Iceland	165		78	107
Irish Free State	307	626	709	398
Italy	39,887	65,489	171,555	574,069
Latvia	78	44		
Lithuania	50	33		
Malta, Gozo, and Cyprus	510	45	51	
Netherlands	6,832	1,001	7,083	3,096
Norway	11,195	3,604	961	2,493
Poland and Danzig	1,614	580	460	
Portugal	4,845	4,333	5,302	14,831
Rumania	2,142	3,292	2,145	19,056
Russia in Europe	268	5,133	345	5,001
Spain	76,191	71,659	100,051	169,680
Sweden	17,933	9,653	3,534	4,049
Switzerland	3,026	24,441	10,647	45,529
Turkey in Europe	100	296		
United Kingdom	55,375	34,256	21,150	20,801
Yugoslavia and Albania	130	323	190	246
Canada	1,237,960	1,128,893	2,449,666	5,406,233
British Honduras	549	760	482	264
Costa Rica	1,306	1,348	4,370	2,948
Guatemala	5,302	1,941	4,007	7,881
Honduras	2,334	1,393	2,465	4,107
Nicaragua	1,024	195	2,146	1,097
Panama	4,032	2,855	2,328	5,343
Salvador	17,202	3,385	6,781	3,436
Mexico	73,170	63,013	147,513	747,657
Miquelon and St. Pierre Islands		25	48	149
Newfoundland and Labrador	7,157	15,637	12,575	46,751
Bermudas	2,948	1,666	6,164	10,777
Barbados	153	128	248	365
Jamaica	3,275	3,162	3,826	6,226
Trinidad and Tobago	1,673	349	1,370	1,549
Other British West Indies	2,515	3,468	7,548	10,314
Cuba	41,813	17,452	110,325	381,980
Dominican Republic	3,304	3,310	12,390	9,844
Netherland West Indies		802	1,209	633
Haiti	2,851	4,335	1,217	2,538
Virgin Islands	446		137	301
Argentina	293,202	453,475	482,371	669,484
Bolivia	701	2,129	2,799	3,314
Brazil	86,061	91,540	99,026	171,973
Chile	16,718	15,005	33,197	101,335
Colombia	5,095	2,441	12,689	29,992
Ecuador	1,332	267	3,171	478
British Guiana	40	260	132	
Surinam				34
French Guiana				310
Paraguay	147	62	196	
Peru	2,995	3,416	3,341	4,742
Uruguay	26,403	111,830	148,385	130,050
Venezuela	29,928	1,309	1,879	2,800
British India	6,632	22,574	8,654	7,011
British Malaya	398	185	485	959
Ceylon	542	630	223	470
China	15,257	20,976	34,279	51,902
Java and Madura	414	214	657	585
Other Netherland East Indies	60	613	188	2,264
Hong Kong	2,058	690	440	8,522
Iraq		164		
Japan	82,502	15,478	29,540	16,551
Kwantung	391	435		2,020
Palestine	350	86	150	125
Persia				226
Philippine Islands	27,817	20,093	52,808	46,620
Siam		55	2,154	639
Russia in Asia		95		
Syria	60	10		100
Turkey in Asia	164	32		
Australia	266,617	429,831	349,414	489,989
British Oceania	1,151	1,191	396	2,511
French Oceania	200	852	1,180	2,572
New Zealand	319,272	229,313	112,519	378,768
Belgian Congo				208
British East Africa				317
British South Africa	16,425	15,667	25,147	77,569

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS—Continued

Country of destination	1926	1927	1928	1929
RECEIVING SETS—continued				
Egypt	$800	$403	$163	$2,059
Algeria and Tunisia			40	158
Liberia	164	164	115	
Morocco		78	618	2,174
Mozambique	28		651	166
Other Portuguese Africa		89		
Canary Islands	1,601	392	95	
Other Spanish Africa		163	231	1,627
Total	2,873,676	2,961,301	4,549,825	9,775,655
TUBES				
Austria	526	1,235	2,237	8,017
Azores and Madeira Islands			175	
Belgium	5,447	9,267	23,918	5,100
Bulgaria		125	357	426
Czechoslovakia	1,276	4,285	2,838	4,589
Denmark	1,621	7,569	10,859	33,348
Estonia	203		1,727	90
Finland	287	278	833	264
France	3,890	4,420	8,551	26,562
Germany	4,885	2,967	1,576	6,510
Gibraltar				35
Greece	76	430		198
Hungary	128	874	1,257	687
Iceland			33	
Irish Free State		185		
Italy	7,529	11,528	38,179	117,624
Latvia			172	36
Malta, Gozo, and Cyprus			229	
Netherlands	2,199	970	1,532	2,133
Norway	2,809	1,234	785	630
Poland and Danzig	162	633	739	84
Portugal	68	1,324	1,938	4,527
Rumania	196	412	592	6,397
Russia in Europe	143	1,329	520	1,807
Spain	11,763	18,229	21,705	50,609
Sweden	3,167	1,137	1,980	1,060
Switzerland	312	8,081	10,211	15,760
United Kingdom	34,089	11,056	22,256	69,536
Yogoslavia and Albania		47		99
Canada	114,068	145,051	173,843	317,217
British Honduras	56	82	222	151
Costa Rica	164	1,795	1,836	3,674
Guatemala	695	306	1,268	2,729
Honduras	668	1,094	925	1,063
Nicaragua	574	215	1,171	3,540
Panama	2,328	5,629	5,218	5,366
Salvador	1,822	472	759	1,250
Mexico	8,297	7,880	17,787	108,406
Miquelon and St. Pierre Islands		12		20
Newfoundland and Labrador	1,308	1,509	1,864	9,475
Bermudas	512	193	657	1,484
Barbados			171	206
Jamaica	52	743	443	1,694
Trinidad and Tobago	36	110	254	838
Other British West Indies	77	199	1,260	1,586
Cuba	18,045	19,651	23,959	101,907
Dominican Republic	5,049	225	4,455	1,686
Netherland West Indies		309	497	922
French West Indies			30	
Haiti	822	1,017	262	1,247
Virgin Islands	27			73
Argentina	79,659	117,257	123,515	213,023
Bolivia	14	304	279	1,488
Brazil	33,150	56,012	69,142	90,248
Chile	8,961	11,898	17,200	31,577
Colombia	361	10,249	16,055	18,324
Ecuador	33	139	563	1,901
British Guiana		33	19	65
Surinam				25
Paraguay	43	68		
Peru	684	1,849	1,890	6,006
Uruguay	7,007	19,734	25,904	35,581
Venezuela	3,693	3,781	3,286	7,842
British India	913	554	1,366	2,487
British Malaya	12	275	306	1,136
Ceylon	37	29		712
China	5,811	22,927	33,178	46,021
Java and Madura	1,125	1,050	145	4,627

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS—Continued

Country of destination	1926	1927	1928	1929
TUBES—continued				
Other Netherland East Indies			$124	$38
French Indo-China				62
Hong Kong	$597	$167	128	9,186
Japan	194,951	95,283	74,918	89,263
Kwantung				181
Palestine				2,524
Philippine Islands	14,573	39,039	18,708	31,454
Russia in Asia			3,445	
Siam			1,423	621
Syria		21		
Australia	221,608	267,093	178,534	329,745
British Oceania	73	239	11	2,953
French Oceania		139	198	
New Zealand	53,955	76,166	46,937	125,857
British East Africa		315		
British South Africa	4,649	3,930	3,575	18,475
British West Africa			58	20
Egypt	20	15		372
Algeria and Tunisia				28
Liberia		1,600		473
Morocco			49	700
Mozambique			62	13
Canary Islands	203	44	110	148
Other Spanish Africa		10	51	661
Total	867,631	1,004,337	1,017,560	1,997,409
RECEIVING-SET COMPONENTS				
Austria	1,002	1,771	1,674	1,559
Azores and Madeira Islands		49		40
Belgium	3,111	4,184	24,286	41,982
Bulgaria			106	
Czechoslovakia	9,415	8,816	3,904	8,019
Denmark	35,565	36,601	22,942	27,368
Estonia		32	60	5
Finland	1,978	5,035	8,742	832
France	8,175	3,653	17,388	54,776
Germany	7,794	5,321	14,506	15,494
Greece	22	1,786	819	
Hungary	87	351	143	1,906
Iceland	199			
Irish Free State	4,081	2,403	1,038	
Italy	8,752	26,240	58,483	117,132
Latvia	163		473	774
Lithuania		33		
Malta, Gozo, and Cyprus	322		37	
Netherlands	85,979	71,306	148,412	216,459
Norway	5,714	2,789	627	870
Poland and Danzig	1,177	15,015		1,237
Portugal	2,074	2,202	2,456	8,037
Rumania	5,614	3,460	593	11,126
Russia in Europe	341	607	799	2,653
Spain	37,304	43,854	32,393	63,418
Sweden	17,055	7,801	5,157	3,484
Switzerland	1,593	3,686	9,499	52,885
Turkey in Europe	27	26		
United Kingdom	238,055	120,907	165,523	205,362
Yugoslavia and Albania		20		100
Canada	500,427	635,671	1,280,602	2,213,762
British Honduras	203	54	61	163
Costa Rica	920	624	1,054	4,488
Guatemala	1,147	1,072	725	2,886
Honduras	2,223	829	1,407	1,923
Nicaragua	799	444	1,188	2,360
Panama	4,939	6,994	6,216	15,121
Salvador	3,857	563	944	698
Mexico	25,861	29,771	14,655	61,256
Miquelon and St. Pierre Islands				80
Newfoundland and Labrador	2,149	1,443	2,911	7,765
Bermudas	337	1,063	2,531	2,417
Barbados	131	621	773	841
Jamaica	322	1,209	1,941	3,877
Trinidad and Tobago	143	889	1,899	2,989
Other British West Indies	670	970	1,794	1,692
Cuba	12,510	14,261	36,412	46,373
Dominican Republic	1,337	2,236	3,318	5,147
Netherland West Indies	43	1,115	1,994	3,068
French West Indies			87	50
Haiti	670	1,535	1,136	877

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS—Continued

Country of destination	1926	1927	1928	1929
RECEIVING-SET COMPONENTS—continued				
Virgin Islands		$99	$138	$189
Argentina	$194,295	481,852	583,335	416,129
Bolivia	843	364	1,565	3,592
Brazil	102,947	134,224	89,456	128,422
Chile	5,097	10,542	11,614	19,879
Colombia	2,564	8,958	12,021	16,106
Ecuador	237	562	432	2,081
British Guiana	130	224	1,630	1,311
Surinam		69	88	29
Paraguay	106	218	254	546
Peru	2,071	5,088	6,325	6,650
Uruguay	15,268	33,541	37,674	41,692
Venezuela	3,611	10,899	2,575	10,653
Arabia			360	
British India	2,168	5,038	3,747	2,873
British Malaya	462		733	1,013
Ceylon	356	319	5,237	147
China	9,734	2,572	14,725	50,232
Java and Madura	3,254	2,095	1,705	19,446
Other Netherland East Indies	668	696	724	396
French Indo-China				297
Hong Kong	1,572	6,650	4,801	26,108
Japan	107,306	53,368	55,549	33,882
Kwantung	832		777	1,075
Palestine			125	
Philippine Islands	5,890	10,089	8,657	25,972
Russia in Asia	500	2,025		1,149
Siam		76	640	3,590
Turkey in Asia		13	99	
Australia	391,668	343,119	239,992	273,382
British Oceania	3,574	2,368	348	450
French Oceania	144	89	289	
New Zealand	122,296	126,330	77,799	92,406
British East Africa				15
British South Agrica	4,250	4,466	6,986	19,685
British West Africa				210
Egypt	683	209	547	3,761
Liberia	115	20	78	34
Morocco				713
Mozambique			1,616	243
Canary Islands	428	168	211	1,311
Other Spanish Africa				361
Total	2,016,466	2,305,721	3,054,310	4,419,381
RECEIVING-SET ACCESSORIES [1]				
Austria	616	450	867	1,678
Azores and Madeira Islands		31		107
Belgium	5,509	2,595	4,847	3,733
Bulgaria		291	233	
Czechoslovakia	14,346	6,611	3,034	1,665
Denmark	60,338	24,786	31,317	11,885
Estonia	650		119	24
Finland	2,189	3,212	4,827	973
France	11,870	17,326	31,674	41,769
Germany	17,743	11,954	49,871	73,850
Gibraltar			22	5
Greece	1,491	1,375	239	71
Hungary	735	338	2,106	865
Iceland			74	
Irish Free State	94	220	26	26
Italy	10,866	24,423	60,981	40,980
Latvia	210	17		
Malta, Gozo, and Cyprus		326	385	224
Netherlands	59,674	55,692	50,554	38,485
Norway	7,597	1,735	1,944	104
Poland and Danzig	150	1,011	184	1,786
Portugal	1,056	1,352	1,938	1,101
Rumania	684	746	488	2,442
Russia in Europe	454	410	106	49,514
Spain	29,909	14,610	16,082	11,272
Sweden	18,063	16,903	8,182	7,649
Switzerland	2,756	4,838	11,878	12,277
Turkey in Europe		188		
United Kingdom	125,313	64,780	224,671	118,946
Yugoslavia and Albania	28	57	42	
Canada	1,019,957	1,224,147	1,105,097	1,732,195

[1] 1926–1928 included loud-speakers.

VALUE OF UNITED STATES EXPORTS OF RADIO APPARATUS—Continued

Country of destination	1926	1927	1928	1929
RECEIVING-SET ACCESSORIES [1]—continued				
British Honduras	$767	$349	$171	$174
Costa Rica	1,999	1,927	3,067	9,723
Guatemala	3,452	2,239	3,316	2,609
Honduras	4,288	7,547	1,484	1,735
Nicaragua	1,208	1,601	2,097	1,248
Panama	6,585	6,191	6,471	3,554
Salvador	4,199	802	1,477	1,144
Mexico	51,092	33,978	35,923	48,038
Miquelon and St. Pierre Islands		8	61	944
Newfoundland and Labrador	2,221	4,401	7,954	5,932
Bermudas	302	787	2,060	473
Barbados	239	120	349	69
Jamaica	341	875	2,279	2,128
Trinidad and Tobago	127	681	1,555	435
Other British West Indies	2,205	533	1,248	4,010
Cuba	24,696	26,599	37,870	26,121
Dominican Republic	10,254	907	3,736	1,227
Netherland West Indies	15	496	573	799
French West Indies			95	
Haiti	1,528	1,783	827	2,091
Virgin Islands	16			14
Argentina	113,542	135,956	225,218	73,738
Bolivia	572	186	812	4,829
Brazil	57,071	66,207	73,480	29,815
Chile	10,723	10,799	15,377	23,126
Colombia	1,706	2,577	9,157	17,334
Ecuador	1,400	77	1,017	992
British Guiana	37	33	228	66
Surinam		104	10	102
Paraguay	248	117	319	
Peru	2,350	1,705	2,320	6,566
Uruguay	7,685	29,839	31,238	11,500
Venezuela	13,185	4,418	1,041	2,269
British India	1,994	1,075	1,654	1,527
British Malaya	220	4	471	141
Ceylon	259	35	60	61
China	23,330	11,964	22,766	19,420
Java and Madura	1,538	4,239	2,239	2,827
Other Netherland East Indies	215	2,090	1,089	606
Hong Kong	3,149	897	3,786	11,688
Iraq	53	19		
Japan	168,765	84,705	61,693	42,416
Kwantung	670	112	120	65
Philippine Islands	12,990	9,846	15,305	14,951
Russia in Asia		34	100	18
Siam			127	1,338
Syria		3		75
Turkey in Asia		191		
Other Asia		79		
Australia	419,444	457,949	405,266	109,960
British Oceania	12,801	904	458	745
French Oceania	227	1,003	549	917
New Zealand	112,724	100,215	48,756	42,403
British East Africa			36	
British South Africa	5,043	7,417	19,573	10,520
British West Africa	15	30	65	1,430
Egypt	667	235	45	309
Algeria and Tunisia			10	
Liberia		2,478	1,581	1,544
Morocco	55	49	404	135
Mozambique	42		42	58
Other Portuguese Africa		33		
Canary Islands	488	55	174	
Other Spanish Africa		19		143
Total	2,481,040	2,539,946	2,670,987	2,699,728

[1] 1926–1928 included loud-speakers.

The value of loud-speakers exported in 1929 and the total value of all radio equipment sent to each country during that year are shown in the following table:

VALUE OF LOUD-SPEAKERS AND TOTAL VALUE OF ALL RADIO EQUIPMENT EXPORTED FROM THE UNITED STATES IN 1929

Country	Loud-speakers	Grand total	Country	Loud-speakers	Grand total
Austria	$1,279	$17,073	Haiti	$178	$13,229
Azores and Madeira Islands	70	1,005	Virgin Islands	15	712
Belgium	20,381	76,663	Argentina	194,785	1,775,531
Bulgaria		1,440	Bolivia	716	14,255
Czechoslovakia	3,278	33,420	Brazil	43,436	550,037
Denmark	5,213	87,094	Chile	31,387	217,932
Estonia	16	511	Colombia	8,673	99,096
Finland	691	3,928	Ecuador	457	5,909
France	54,708	203,516	British Guiana	180	1,622
Germany	74,353	191,090	Surinam	13	203
Gibraltar	10	100	Paraguay		546
Greece	316	1,787	Peru	1,685	27,893
Hungary	479	4,222	Uruguay	28,116	253,585
Iceland	5	112	Venezuela	2,822	48,768
Irish Free State	32	456	British India	846	14,744
Italy	141,090	1,145,376	British Malaya	407	3,737
Latvia		1,137	Ceylon	31	1,421
Malta, Gozo, and Cyprus	48	272	China	10,056	412,694
Netherlands	40,832	307,452	Java and Madura	921	85,216
Norway	597	5,044	Other Netherland East Indies	47	7,094
Poland and Danzig	327	8,154	French Indo-China		359
Portugal	2,091	31,126	Hong Kong	3,426	59,556
Rumania	5,599	44,654	Japan	56,704	282,175
Soviet Russia in Europe	36	414,762	Kwantung	459	3,986
Spain	30,773	366,763	Palestine		2,699
Sweden	2,887	19,129	Persia	18	244
Switzerland	17,155	143,516	Philippine Islands	9,765	297,107
United Kingdom	208,444	631,186	Siam	265	6,503
Yugoslavia and Albania	78	523	Soviet Russia in Asia		1,167
Canada	734,353	10,784,156	Syria		175
British Honduras	50	802	Australia	329,184	1,541,876
Costa Rica	816	24,851	British Oceania	172	6,831
Guatemala	1,204	20,222	French Oceania	52	3,548
Honduras	394	14,426	New Zealand	58,841	699,736
Nicaragua	228	10,293	Belgian Congo		208
Panama	2,460	50,064	British East Africa		332
Salvador	945	8,930	Union of South Africa	10,336	135,808
Mexico	54,713	1,041,288	Other British South Africa		798
Miquelon and St. Pierre Islands	12	1,205	Gold Coast	146	396
Newfoundland and Labrador	7,587	79,607	Other British West Africa		1,410
Bermudas	1,585	16,736	Egypt	447	7,021
Barbados	325	1,899	Algeria and Tunisia	338	524
Jamaica	1,800	15,725	Liberia		2,208
Trinidad and Tobago	1,808	7,799	Morocco	122	3,844
Other British West Indies	1,760	20,637	Mozambique		480
Cuba	72,972	658,038	Canary Islands	58	1,517
Dominican Republic	325	20,023	Other Spanish Africa	137	2,929
Netherland West Indies	152	6,224			
French West Indies		50	Total	2,289,491	23,122,147

THE RADIO MARKETS BY COUNTRIES

NOTE.—The languages given are those in which broadcasting is done, or, in the absence of local broadcasting, the language in which broadcasting should be most successful. This is not necessarily the commercial language or the mother tongue of the country. This statement is deemed important in view of the fact that a certain amount of confusion has arisen in the past where differentiation has not been made.

NORTH AMERICA

BAHAMAS

Language, English; area, 4,404 square miles; population, 54,886

The development of radio in the Bahamas is steadily increasing. The group consists of 29 inhabited islands and numerous cays. The climate is poor for radio, being warm and damp, with hot summers and cool winters. From December to March conditions are said to be good, but during the remainder of the year there is considerable trouble from atmospherics.

Broadcasting is prohibited. Receiving licenses are issued upon payment of a fee of 5 shillings, required annually. No other restrictions are imposed. Some 300 receiving sets are in use, 4, 5, and 6 tube battery sets predominating. Nassau, with 16,000 population, has about 98 per cent of these. Most of the sets are of American origin, though some British sets have been installed. One American 6-tube set is reported to regularly receive stations as far west as Chicago, being powered by storage battery and B eliminator.

Only Nassau has central-station electric service, which is 110 volts, 60-cycle alternating current. A growing number of socket power sets are in use. Because of the climatic difficulties, short-wave sets and adapters are increasing in popularity, though it is reported that reception of short-wave broadcasts from Europe is not entirely satisfactory.

Reception from stations in the United States and Canada is good between the months of October and April, and some reception is to be had all year, though from May to September there is considerable trouble from static.

BARBADOS

Language, English; area, 166 square miles; population, 198,336

In common with other English-speaking parts of North America, Barbados presents a radio development of a higher order than the general conditions would indicate. There is evidence that development will continue. The climate is poor for reception; the summers are hot and the winters warm, and static is bad at all seasons. Reception is possible only from December to March.

The law governing radio was adopted on December 3, 1925, placing the controlling authority with the governor in executive committee.

Licenses are required for broadcasting, receiving, and importing, with a penalty of not exceeding £100 for violations. No broadcasting stations are operating in Barbados, the nearest ones being in the United States, Cuba, Haiti, Dominican Republic, and Porto Rico. The number of receiving sets in use is estimated at 250. Very few, if any, alternating-current receivers are in use. The lighting plant at Bridgetown gives service at 110-volt, 50-cycle alternating current. Some short-wave sets have been put into operation.

BERMUDAS

Language, English; area, 19 square miles; population, 21,987

Bermuda is one of the most advanced of the smaller colonial possessions of the British Empire in respect to radio. While conditions in this part of the world are not entirely satisfactory for reception, development has been comparatively rapid, and the number of sets in use is constantly increasing. About one-third of the population is white. Hamilton is the only city; almost the entire population of the colony is included in this urban district. Some 350 small coral islands, only 20 of which are occupied, make up the group. The weather is hot throughout the year, but radio reception is fairly good from October to March. Reception is subject to fading, static, and interference from a Government wireless station at all times.

The only regulations are those specified for communicating stations, under which it has been ruled that receiving-set owners must secure licenses. There is no broadcasting in Bermuda, the nearest stations being those in the United States. Receiving sets are said to number 700. Most of these were purchased from American sources and are of the better quality. The cheaper sets do not meet the requirements of conditions existing in Bermuda. Few alternating current or short-wave sets have been installed. Where central-station electric service is available, 100-volt, 60-cycle alternating current is provided.

CANADA

Language, English; area, 3,684,723 square miles; population, 9,796,800

Only a few countries of the world precede Canada in point of progress in radio development, all being countries of appreciably greater population. The conditions affecting development are almost identical with those in the United States, to which this development is comparable. In some respects, such as climate, Canadian conditions are more advantageous than our own. In the populous southern section broadcast reception is very popular, while in the more sparsely settled northern areas radio has provided a highly valuable means of entertainment and news communication.

Canada has warm summers, winters being cool in the southern areas and cold through the north. Radio reception is good at all times of the year throughout all Provinces, only slight static interference being encountered from heat during the summer. There are no exceptional regulations governing broadcasting, though there has been much recent agitation for a change to a system based on that of the United Kingdom. The use of receiving sets is restricted only by the assessment of an annual license fee of $1. Broadcasting by more than one station in any city at one time is discouraged by assigning identical wave lengths to all stations in or near that city, with particular exceptions made by the Department of Marine and Fisheries, the Government body administering radio matters.

Canada has 64 broadcasting stations, in all populated parts of the country, and nine amateurs who broadcast occasionally, using a wave of 250 meters. Receiving licenses numbered 296,926 on July 1, 1930. Some estimates of the sets not registered run as high as 40 per cent of the total, though it is generally questioned whether, in view of the small license fee, the actual number of evasions is large. Alternating-current sets are popular, and short-wave sets are becoming numerous, especially in the more isolated districts of the north. Central-station electric service is usually at 110-volt, 60-cycle alternating current.

Formerly nearly all of the receiving equipment used in Canada was of American manufacture, but there has been a strong impetus given to Canadian radio manufacturing by the establishment of numerous branch factories in Canada by American firms and by the growth of a considerable independent industry. This overcomes the difficulty arising from the high duty on radio apparatus and the sales tax on imported goods required by Canadian law. This tendency has been apparent in recent years in the trend of American radio exports to Canada. That country, nevertheless, remains the best market for American radio apparatus. In 1928 Canada set a new record in the proportion of American radio exports purchased, and the total itself was considerably higher than in any previous year. In 1929 the statistics were yet more striking, Canada taking nearly $11,000,000 out of slightly over $23,000,000 total radio exports, the Canadian figure barely falling short of the previous world record total.

Because of the tendency that has become particularly apparent during 1928 in all radio-manufacturing countries for the owners of radio patents to exercise more strictly their rights under those patents, the marketing of equipment in Canada should follow only after a study of the situation in regard to patents under which the merchandise is manufactured. Licensing in the United States is not sufficient procedure in most cases. A corporation, Canadian Radio Patents (Ltd.) has secured control of many important radio patents and requires the payment of a minimum fee of $10,000, plus a royalty of 10 per cent, on all radio sets and tubes manufactured or imported into Canada. As a direct result several American manufacturers have withdrawn from the Canadian market.

The Government-controlled Canadian National Railways have developed the use of radio on trains to the extreme. Broadcasting stations throughout the railway's service area are operated as a chain to provide programs primarily for reception on the various transcontinental trains. This development is the subject of considerable interest from an engineering point of view and is the most intensive example of such use of radio in the world.

COSTA RICA

Language, Spanish; area, 23,005 square miles; population, 471,521

Costa Rica has shown considerable interest in broadcasting, and the resulting developments are of a reasonably well-advanced nature,

although general conditions are not such as to encourage any expectation of great developments. The experience of Costa Rica should prove of value in advancing radio throughout Central America.

Agriculture is the principal industry. The most important cities are San Jose, Port Limon, and Heredia. The country is mountainous with plains on the coast. The climate, as in the rest of Central America, is poor for radio, being hot at all seasons. Reception is fair from November to March. No reception is possible during the summer months.

Radio regulations adopted by Costa Rica in 1920 and 1921 were of such nature as to have no application beyond wave-length control in broadcasting. In July, 1929, the Government transmitted the recommendations of the Washington Radio Conference to the Constitutional Congress, recommending their acceptance and the provision of a radio law to be enforced by a radio commission.

A Government broadcasting station, the gift of the Mexican Government, is operated in San Jose, and a short-wave station at Heredia. Balboa, Guatemala, and Salvador may be received with more or less success. Estimates of up to 700 sets installed have been made, but it is believed that about 250 is a more nearly accurate figure. Most of these sets are of American manufacture, but a fair number of British and German sets are also in use. Only one or two alternating-current sets have been installed, with about the same number of short-wave sets. Central-station service is preponderantly 110-volt, 60-cycle alternating current, but there is some variation in regard to many of the smaller plants.

CUBA

Language, Spanish; area, 44,164 square miles; population, 3,418,033

Cuba, the largest island of the West Indies, has much the greatest degree of radio development, broadcast reception having proved especially popular with Cubans. Although at no time has there been any spectacular development, a steady advance has been maintained. Further increase in the future is clearly indicated by the steady promotion of radio that has maintained in the past. The principal cities of the island are Habana, Camaguey, Cienfuegos, Santiago, and Matanzas. The three topographical regions are the eastern mountain, the central plain, and the western hill areas. The climate is fair for radio except in summer, reception being good from November to March. The mean annual temperature at Habana is 77° F. Both summers and winters are classed as hot, and reception is marred by static at all times.

The local purchasing power depends almost entirely upon the market price for raw sugar, and, to a lesser extent, that for tobacco. When prices are high there is a great influx of money, but when prices are low the number of families having any surplus for luxuries is very few.

Permits are required for broadcasting. Receiving is allowed without restriction.

There are 66 broadcasting stations, 31 being in Habana and the remainder scattered throughout Cuba. Stations in the United States are received regularly, as well as those in Porto Rico, Haiti, and other Caribbean countries. Since Cuban stations cover the entire dial, international reception is somewhat hampered, while climatic conditions prevent such reception except in winter.

On September 5, 1930, the wave lengths of Cuban broadcasting stations were reassigned on a basis resembling the channel system employed in the United States. A few of the channels coincide with American assignments, the remainder being fixed midway between them.

Recent estimates indicate that some 28,875 receiving sets are in service in Cuba. Most of these are of American origin, while a number have been constructed locally from American parts. Alternating-current sets have proved popular among the classes able to afford the investment necessitated and are now sold almost to the complete exclusion of battery sets. The current supplied by central stations varies widely, with 110-volt, 60-cycle alternating current slowly taking predominance. There is also considerable 220-volt, 60-cycle alternating current. Both these voltages are used in Habana. Short-wave reception is also popular, but among a much smaller class.

DOMINICAN REPUBLIC

Language, Spanish; area, 19,325 square miles; population, 897,405

Radio conditions in the Dominican Republic have not warranted any particularly great development. While there has been some advance, it is not comparable with that in Haiti, Cuba, or Porto Rico.

The Republic occupies roughly half the island of San Domingo, or Haiti, the Haitian Republic covering the remainder. The surface consists mainly of plains, bordered along the Atlantic coast by low mountains, with high mountains in the center of the island. The southern coast is arid. The climate is hot, both in summer and winter. Radio reception is fair from October to March, but very poor the rest of the year.

No radio regulations have been reported. There is one broadcasting station at Santo Domingo. Stations at Port-au-Prince (Haiti), San Juan (Porto Rico), and in Cuba and the United States are received. Estimates place the number of receiving sets in use at 1,250, mostly of American manufacture. Short-wave sets have proved particularly popular, and some alternating-current sets are in use. The largest cities have central-station service of 110 volts, 60 cycles.

FRENCH WEST INDIES

Language, French; area, 1,073 square miles; population, 474,268

Radio equipment in the French West Indies (Guadeloupe, Martinique, etc.) is practically nonexistent. In common with other parts of the West Indies, the climate is always hot and radio reception accordingly poor.

No radio regulations have been issued, but under the general French law receiving sets are licensed at a cost of 10 francs annually. There is no broadcasting, programs from stations in various Caribbean countries being received with more or less success. About 100 receiving sets are in use, all of French manufacture. While it would

be necessary to lay all of the groundwork, it is not improbable that a number of short-wave sets might be sold, particularly in view of the short-wave broadcasts from the Eiffel Tower in Paris. The lighting current in Fort de France and Lamentin is 110 volts direct, but is not well maintained in either place.

GREENLAND

Language, Danish; area, 46,740 square miles; population, 14,355

Very little is known about radio in Greenland. A rumor that a broadcasting station is operating in Greenland has not been authenticated. About 25 receiving sets have been reported in use. Short-wave sets might be sold to a certain extent for the purpose of keeping in touch with Denmark, although sets limited to the broadcast band probably are able to serve this purpose equally well. All sales would be through Danish houses.

GUATEMALA

Language, Spanish; area, 42,353 square miles; population, 2,119,165

Radio has proved particularly popular in Guatemala, even though the field is limited by natural conditions and the concentration of wealth in the hands of a small part of the population. Greater future developments are indicated. About 20 per cent of the people are of the white race. Guatemala, Quezaltenango, Coban, and Totonicapan are the principal cities. The country is mountainous and has a very poor climate for radio. It is hot in the coastal lowlands and warm in the mountains through the year. The mean annual temperature ranges in different sections from 70° to 80° F., and the rainfall is heavy. Static is very bad. There is no reception from April to August, but it is fair from November to early February; during the remainder of the vear results are poor.

Owners of receiving sets are required to pay a $5 installation fee, and merchants must notify the Government of all sales of radio apparatus. A broadcasting station is operating in Guatemala City, and stations in Salvador, Costa Rica, Panama Canal Zone, and Mexico may be received with more or less regularity. Installations of receiving sets now number about 250. Practically all are of American manufacture, though a few German sets are in use.

Alternating-current receivers have not been purchased in any number. In Guatemala City the central-station service is provided at 110 volts, 60 cycles, but elsewhere various voltages are used, including 100, 125, 200, 220, and 250, some direct current, and varying frequencies in alternating current. Short-wave sets have been introduced quite successfully.

HAITI

Language, French; area, 10,204 square miles; population, 2,300,200

Haiti, the only French-speaking Republic in North America, has an exceptionally high degree of radio development, considering the general conditions and the limited number of people who could be expected to purchase radio equipment. The Government encourages radio reception, but the market remains somewhat unresponsive.

One-tenth of the population is white. The principle cities are Port au Prince, Cape Haitien, and Gonaives. Almost all of the territory is mountainous, and the climate very poor for radio. Reception is possible only between October and April. Hot weather maintains at all seasons.

Broadcasting is a government monopoly, one station being installed at Port au Prince for educational purposes. There is no restriction on the ownership or operation of receiving sets. Stations in the Dominican Republic, Porto Rico, Cuba, and the southeastern part of the United States are received. It is estimated that 750 receiving sets are in use, but a greater number is not improbable. Almost all are of American manufacture. Alternating-current sets have been introduced, but their success is not yet fully known. Most central-station service is 110 volts, 60 cycles, alternating current. A combination short and long wave receiver is the most popular type. Short-wave reception is commonly demanded, and short-wave adapters are sold.

HONDURAS

Language, Spanish; area, 46,332 square miles; population, 773,408

Honduras does not have any great radio development, although broadcasting is proving popular among a small class of the population. The principal cities are Tegucigalpa, Comayagua, and La Esperanza. The country consists of a broad central plateau with wide coastal plains. The climate of the coast is hot, but the plateaus are cool. Rainfall is abundant. Static is bad most of the year, reception being possible only during the wet season—from September to March. No radio regulations have been adopted. A short-wave broadcasting station was opened in Tegucigalpa in 1929. Stations in Salvador, Guatemala, and Costa Rica are received with fair success, with intermittent reception from Panaman, Mexican, Cuban, and American stations. Some 78 receiving sets are in use, nearly all of American manufacture. The use of alternating-current and of short-wave sets has not been reported. Lighting current is usually 110 volts, but variations in the case of several communities, some of them important, are noted. The frequency in the case of the 110-volt stations is generally 60 cycles.

JAMAICA

Language, English; area 4,450 square miles; population, 858,188

Jamaica has a greater development than seems warranted by the conditions existing there, which probably may be explained by the fact that the population is English speaking, and reception of American stations is good. Approximately 15,000 of the population are white. The purchasing power is generally low. Kingston, Port Antonio, Spanish Town, and Montego Bay are the principal cities. The surface is generally mountainous, only about one-sixth of the territory being flat. The climate is tropical except in the highlands, where it is more temperate. Because of static, reception is impossible except between October and March, and then is satisfactory only after 10 p. m.

No regulations governing radio have been issued, but a license on each receiving set is required. There is no broadcasting; stations in

Cuba, the United States, and the Caribbean countries are depended upon for programs. About 250 receiving sets are in use, according to a recent report. These are about evenly divided between British and American manufacture. Short-wave sets have practically displaced all others because of static conditions. The best service is obtained from 3, 5, and 7 tube models. Alternating-current sets in use have not proved entirely satisfactory because of static conditions. Central-station service is provided at 110 volts, 25 and 40 cycles, and at other voltages and frequencies in various parts of the island.

MEXICO

Language, Spanish; area, 760,200 square miles; population, 14,308,753

Radio in Mexico enjoys an increasing popularity, and development has been steady. The climate and other conditions do not interfere with good reception sufficiently to discourage the purchase of receiving sets by a comparatively large part of the population. Unity of language and nationality gives a greater value to broadcasting in distant parts of the country; in other parts of Latin North America no station has this advantage at any great distance. Mexico City, Guadalajara, and Puebla are among the principal cities. The interior is mainly a high table-land broken by mountains, while the coasts are bordered by plains. The central and northern table-land has a moderate climate, but the coasts and southern areas are tropical. The rainy season extends from May to October, and static is bad in all sections during that season. Reception becomes fair in all parts of the country during November, extending to February in the south and April in the north.

Broadcasting is administered through the Department of Communications and Public Works. Permits to broadcast are required and are granted only to Mexican citizens. The Government reserves the right of censorship. Broadcasting is supported by the owners and operators of the stations. There is no monopoly. While many of the stations are operated by Government departments, the majority are privately owned. Registration of receiving sets is required.

Mexico has 28 broadcasting stations, 12 being in Mexico City. Three of these operate on short waves. Northern Mexico and the Gulf coast receive American stations easily. To the southeast, Central American stations are picked up. More distant stations provide occasional reception.

The number of receiving sets in use is estimated at 100,000. More than 90 per cent are of American origin. Several other countries are represented, and there is a small but growing radio-manufacturing industry in Mexico.

Alternating-current sets are at present most in demand. While 110-volt, 60-cycle, alternating current is general, characteristics vary so greatly that particular information should be secured. Short-wave reception is common among a small part of the population, but in general is popular only with experimenters.

When installment sales are contemplated, it is well to investigate the Mexican law. Suspension of title transfer until payments are completed is not legal, nor are chattel mortgages.

MIQUELON AND ST. PIERRE

Language, French; area, 93 square miles; population, 3,918

The development of radio in Miquelon and St. Pierre has been slow since there is no broadcasting in French available, except such as may be received from the French-speaking stations in Quebec. No regulations are in force except such as have been adopted in France for all colonies. Under these regulations, a 10-franc annual license fee is collected from the owner of each receiving set. About 25 receiving installations have been made. Most of these sets are of French origin. No alternating-current sets are yet in use. Short-wave reception has aroused some interest.

NETHERLAND WEST INDIES

Language, Dutch; area, 403 square miles; population, 58,931

The Netherland West Indies lie in the poorest part of the Caribbean for radio reception, and the development has been correspondingly small. There is a further disadvantage in the lack of broadcasting in the Dutch language. The weather is hot throughout the year, and radio reception is poor at all times, although some success is attained between October and February.

Through lack of development, there has been no incentive to the drawing up of a code of radio regulations. There is no broadcasting in the island and none sufficiently near to give really satisfactory service. The station at Caracas, Venezuela, and some of those along the northern part of the Caribbean and Gulf of Mexico can be received occasionally during the best seasons. There are no restrictions upon receivers. Some 50 sets are in use. These are various in origin, including American, British, Dutch, French, and German. Short-wave reception should prove popular, since there is a large station in the Netherlands broadcasting on short waves primarily for the benefit of Netherland colonies. No information as to the present status of short-wave reception is available. Alternating-current sets have not been introduced. Curacao has lighting service at 110 volts, 60 cycles, alternating current.

NEWFOUNDLAND AND LABRADOR

Language, English; area, 165,000 square miles; population, 267,330

Newfoundland and Labrador show a comparatively high rate of radio development, considering the distance from broadcasting stations. The climate and the availability of programs from Canadian and American stations have made it possible for the people to satisfy their unusual interest in radio. The market is small but active. The principal city is St. Johns, in Newfoundland. The surface is generally flat; the summers are cool and the winters long and cold. Reception is good only during the winter, because of interference from the aurora borealis.

There is one broadcasting station in St. Johns, operating on a 395-meter wave length, opened in 1929. Stations in Canada, the United States, and Europe are easily received. There are some 1,250 receivers in Newfoundland and Labrador. Practically all are of Canadian or American manufacture.

Alternating-current sets have aroused considerable interest, although only a few have been placed in service. Lighting service in Newfoundland is uniformly at 110-volt, 60-cycle alternating current. Short-wave reception (up to 50 meters) has been found good at most times. It should grow in popularity.

NICARAGUA

Language, Spanish; area, 49,200 square miles; population, 638,119

The climate of Nicaragua is generally poor for radio, and static is very bad. The principal cities are Bluefields, Corinto, and Managua. The eastern section is a table-land, the remainder of the country being mountainous. The climate of the table-land, however, is more moderate than that of the coast, and reception is therefore a little better. Reception is possible only from November to March during the dry season.

Receiving licenses are necessary, but there are no other special requirements. The country has no broadcasting stations, depending on San Jose, Guatemala City, and San Salvador for programs. A contract for the provision of broadcasting within the Republic was negotiated, but as it carried a monopoly on the importation and sale of radio equipment, which violated the national constitution, it was later cancelled. There has been no subsequent attempt to revive the question. Receivers number 45. There do not appear to be any alternating-current or short-wave sets in use. Most central stations provide service at 110-volt, 60-cycle alternating current, but there are some important variations.

PANAMA

Language, Spanish; area, 33,667 square miles; population, 442,522

Radio has been retarded in the Republic of Panama by a number of highly important conditions, but it has nevertheless proved popular. There is every indication that the future will show an even greater development. The capital and principal city is Panama. The western portion of the country is flat, the eastern mountainous. The climate of the plains is hot and damp, the mean annual temperatures of various sections averaging 80° F. Static is usually very bad. Reception is possible only from December to April.

Broadcasting is prohibited under a treaty between the United States and Panama dealing with the defense of the canal. Receiving permits, costing $2.50, are required.

Broadcasting from stations in the Canal Zone, Salvador, Guatemala, and Costa Rica is received. The Republic is reported to have same 300 receiving sets installed. Most of them are of American manufacture, with a small percentage of German and other European sets.

A few alternating-current sets are reported to be in use. Lighting current is mostly 110-volt, 60-cycle-alternating, but some variations are noted. Short-wave reception is successfully accomplished by a small part of those interested in radio, but the interest has not yet spread to any great extent.

SALVADOR

Language, Spanish; area, 7,225 square miles; population, 1,610,000

Salvador has a comparatively high degree of radio advancement, since its situation on the west coast of Central America gives it a variety of conditions favorable to reception. Radio is popular, but the ownership of sets is restricted to a small class. The principal cities are San Salvador, Santa Ana, and San Miguel. Plains extend along the coast, the interior being a plateau; the region is volcanic. The climate is hot, and the rainy season extends from May to October. Static is very bad. Reception on broadcast waves is possible only between November and February.

Broadcasting is a monopoly of the Government. Receiving is limited to Salvadorians; foreigners will be issued permits if they renounce their right to present claims through diplomatic channels. The following rates are fixed by decree: Application for permit, 5 colons; installation of receiving set, if made by the Government, 30 colons; monthly payment, 3 colons. Regenerative sets are prohibited. Importing, manufacturing, and merchandising are Government monopolies, but concessions are granted.

There is one broadcasting station at San Salvador. Stations in the United States, Cuba, and Mexico are sometimes received, while the stations in Guatemala, Costa Rica, and the Canal Zone are easily picked up. Estimates place the number of receiving sets installed at 51. Nearly all are American, and most of the rest are German. Alternating-current receivers have not yet been fully tested in this market. Lighting service is mostly 110-volt, 60-cycle, alternating current, but many stations provide 220-volt, direct current, and alternating current is supplied in various combinations of 110 and 220 volts with frequencies of 20 and 60 cycles. Popularity has swung to short waves, since reception on this band is much better than on broadcast waves.

TRINIDAD AND TOBAGO

Language, English; area, 1,976 square miles; population, 381,753

There is no great degree of radio development in the British islands of Trinidad and Tobago as compared with other English-speaking countries, since they are situated in a part of the Caribbean subject to extreme difficulties in reception and at a distance from broadcasting stations using the English language.

The principal cities are Port of Spain and San Fernando. The surface is low and flat, with mountains rimming the north and south coasts of Trinidad. The climate is very poor for radio, static being bad at all times.

License fees are charged, varying according to the number of tubes in the receiver, from 10 shillings to £1 annually. No other regulations are in force.

The only satisfactory reception is from Caracas, Venezuela, with some programs coming from Cuba, Porto Rico, Haiti, and the United States. Some 35 receiving installations have been made. Locally assembled sets of British and American parts are being sold. Alternating-current sets have not yet been introduced, except in possible

isolated instances. Short-wave programs are received, but not many people have provided themselves with the proper equipment. The use of long-wave sets has been practically abandoned. Where central-station service is available, the current is alternating, 110 volts, 60 cycles.

SOUTH AMERICA

ARGENTINA

Language, Spanish; area, 1,153,418 square miles; population, 10,904,022

Argentina leads all South American countries in radio developments and ranks fourth among the countries of the world. Aside from Chile and Uruguay, no other South American country has the climatic advantages enjoyed by Argentina, while various other characteristics of the country aid in the use of radio. The people, while concentrated in a limited part of the country's area, are scattered through that area to an extent which makes radio as a means of entertainment and news dissemination particularly advantageous. Buenos Aires is the principal city; Rosario and Cordoba have populations in excess of 100,000, and there are several other important municipalities.

The country consists of a great prairie, bounded on the east by the Atlantic coast and on the west by the Andes Mountains. The climate is temperate in the north and cold in the south. At Buenos Aires the mean annual temperature is 63° F. Radio reception is good through the year, especially from April to September.

Radio is controlled by the Government through the Minister of Marine and the Minister of the Interior. Broadcasting is permitted freely, permits costing only a 1-peso stamp tax on the application. Advertising is employed for revenue. Receiving sets may be installed by anyone, the only requirement being that the chief of naval communications be advised of the installation. There are no exceptional restrictions on importing, manufacturing, or merchandising.

There are 43 broadcasting stations in the Republic, of which 20 are in Buenos Aires. At present those stations actually in Buenos Aires are being moved to the outlying sections beyond the city limits. Additional service in the vicinity of Buenos Aires is provided by stations in Uruguay and Brazil to the northeast and Chile to the west. Small areas receive Bolivian and Paraguayan stations.

A true estimate of the number of sets in use is difficult to obtain, but those from the more reliable sources indicate about 400,000. American sets are the most popular and are in the majority, but many Argentine, British, and German sets are also in use. Argentinians insist upon late-model receivers. The demand is for approximately the same types of sets as are most used in the United States. The use of short-wave reception has shown advancement.

Alternating-current sets are finding increased popularity in Argentina. By far the greatest number of towns and cities are provided with 220-volt direct-current service, and the others have various voltages and frequencies. Buenos Aires has 225 volts, 25 and 50 cycles. The standard American voltage of 110 is rare.

BOLIVIA

Language, Spanish; area, 506,467 square miles; population, 2,952,139

The development of radio in Bolivia is limited by the small proportion of whites and the general lack of desire on the part of the Indians for any of the advantages of civilization. The principal cities are La Paz, Cochabamba, Potosi, Sucre, and Oruro. The eastern section consists of plains, the western of mountains. The climate is good for radio, the mean annual temperature at various altitudes ranging from 50° to 74° F. The rainy season lasts from December to May, 75 inches of rain falling in the lowlands. The best season for radio reception is from April to September.

Radio broadcasting is under the control of the Director General of Telegraphs of the Ministry of Communications. Licenses are granted, without monopoly, for only the gratuitous broadcasting of entertainment. Five minutes of each hour may be employed for the broadcasting of advertising matter. Stations are licensed to operate certain hours daily.

Receiving licenses will be granted to all applicants. An initial registration fee of 5 bolivianos ($1.70) and an annual license fee of 36 bolivianos ($12.25) are charged.

There is one broadcasting station in La Paz. Some reception from Chilean stations and from Lima, Peru, is accomplished. The number of receiving sets in use in Bolivia is about 65, of various origins. Alternating-current receivers have not yet been introduced, and little headway has been made in the introduction of short-wave sets and adapters. The lighting service in La Paz is 120 volts, 50 cycles, while elsewhere 110 or 220 volts, direct current, and 25, 50, and 60 cycles alternating current are found in various combinations.

BRAZIL

Language, Portuguese; area, 3,285,319 square miles; population, 39,163,855

Brazil, because of its size and extent of its coast line, variety of economic activities, and distribution of population. will undoubtedly have great development of radio in the future. The great variance in climate tends to increase advancement in the southern part far beyond the north, in proportion to the population, which itself is largely concentrated in the southern localities. The people are occupied in a number of ways, including agriculture, forestry, and manufacturing, but the concentration of wealth restricts the number of set owners considerably. Broadcasting facilities have developed slowly, this perhaps being the most important factor which has heretofore retarded the growth of the market. Rio de Janeiro, Sao Paulo, Pernambuco, Bahia, and Para, all seaports, are the principal cities.

The radio region of Brazil includes only the coastal strip. The interior is generally heavily forested and sparsely settled. In the list of States in which receiving sets are licensed, only two interior ones are included, and these two are only short distances from the coast. Further references to the "north," "middle," and "south" will mean those sections of the coastal strip.

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In the north there are the usual atmospheric disturbances of the Tropics. There is also some interference from marine telegraphs and shore stations. Climatic conditions improve southward, but even the extreme south is subtropical, and there is a prevalence of atmospherics almost always in an annoying degree. Sao Paulo and Rio de Janeiro, the radio centers of Brazil, lie in latitudes comparable to that of Cuba. The average humidity is high throughout the radio regions of Brazil. Sets should be protected against this condition, especially metal parts and transformers. The use of brass and bronze in preference to aluminum and nickel is highly desirable. Only enameled wire should be installed.

Radio is administered by the Department of Public Works and Transportation, the Department of Marine, and the Department of War. Concessions for the establishment of broadcasting stations are required. There is no monopoly. Receiving is permitted on registration, the fee for which is 20 milreis ($2.40 in United States currency). No annual charge is made. Sets are subject to Government inspection.

Brazil has 23 broadcasting stations scattered along the coast from the mouth of the Amazon to the Uruguayan border, the bulk of them being in the south. Two of these are short-wave transmitters. The southern area also receives Uruguayan and Argentine stations. A recent estimate places the number of receiving sets at 175,000, mostly crystal, approximately 4,000 of which are registered. American sets are in the majority and greatly outsell European products, though German, French, British, and Italian sets are popular in certain sections settled by immigrants of those nationalities. Current of 110, 120, and 220 volts, both alternating and direct current, 50 and 60 cycle frequency, are supplied in various combinations. Rio de Janeiro has 110-volt, 50-cycle alternating current for lighting. Short-wave receivers are becoming popular, and it is possible that this class of receivers will prove more popular than long-wave sets.

BRITISH GUIANA

Language, English; area, 89,480 square miles; population, 299,839

Radio has had little development in British Guiana. Only about 15 receiving sets are in use, mostly British. A short-wave broadcasting station was opened in May, 1929, but there is no indication that the market for radio sets has been greatly stimulated by it. All seasons are hot and static is bad. Reception is possible only between November and February. There are no alternating-current sets and not more than one or two short-wave receivers in the colony. The only central station supplies 110-volt, 60-cycle alternating current.

CHILE

Language, Spanish; area, 281,820 square miles; population, 4,364,395

Chile is one of the foremost countries of South America in radio development, but because of the concentration of wealth, promotion has been slow. Particularly in Santiago there is a great amount of cross-interference between broadcasting stations, and throughout the more heavily populated regions considerable difficulty from

static has been reported from some localities. Climatically, Chile extends through warm, cool, and cold regions, the latter extending to uninhabited regions of frigid temperatures.

The Republic has an extreme width of less than 120 miles and a length of 2,800 miles. Practically all of the population lives in the northern and central parts. Santiago, Valparaiso, Concepcion, and Antofagasta are the principal cities. The country comprises the western slope of the lower Andes Mountains and the narrow coastal plain. The climate varies considerably, owing to the wide ranges of both altitude and latitude. The mean annual temperature at Iquique is 64° F., at Valparaiso 59°, and at Ancud 53°. The rainfall varies extremely.

FIGURE 1.—A cosmopolitan station in Chile, American and British equipment predominating

Radio is controlled by the Ministry of Marine. The only regulations affecting broadcasting are those requiring registration and the ordinary precautions for the safety of the State and the protection of public morals. Registration of receiving sets is required, but no tax or fee is assessed. Six broadcasting stations are operating in Chile, all being in the twin cities of Santiago and Valparaiso. Broadcasting from Lima, Peru, and Buenos Aires, Argentina, is sometimes received, but not with sufficient regularity to be entirely satisfactory.

The number of receiving sets in use has been estimated at 35,000, about 90 per cent being of American origin and the remainder mostly British and German. Several alternating-current sets have been placed in service and appear to be satisfactory, but they are

useful only in the cities. Many important markets still require battery sets. Lighting current is usually supplied at 110 volts, 60 cycles, or 220 volts, 50 cycles, alternating. Short-wave reception is not popular among Chileans, though several foreigners have this equipment.

COLOMBIA

Language, Spanish; area, 482,400 square miles; population, 8,000,000

Radio developments have been greatly discouraged by climatic conditions in Colombia to the point that practically no progress has been made. The principal cities are Bogota, Cartagena, and Barranquilla. The country is generally mountainous. The climate is tropical to the extreme in the lowlands. Static is bad most of the year in all sections. The only reception that is accomplished—and this is said to be unsatisfactory—takes place during January, February, and March.

Colombia has two broadcasting stations at Bogota. These were opened in 1929 and 1930. One operates on a short wave, and there is a possibility that the other will change in the near future, since short-wave reception has been more successful. It has been estimated that 350 receiving sets are in use in Colombia, mostly of American origin. Alternating-current sets are not used. Lighting service characteristics vary considerably between cities. There is no prevailing combination.

ECUADOR

Language, Spanish; area, 118,627 square miles; population, 1,500,000

Ecuador has in the past shown little progress in radio. However, there has recently been a general improvement in radio development, and the number of sets is increasing. Most of the population is of Indian or Negro blood. The principal cities are Guayaquil, Quito, and Cuenca. The entire country is mountainous. The climate is poor for radio, Ecuador being crossed by the Equator. Reception is best from June to September.

Only members of established radio clubs are permitted to own receivers. Reception from Lima, Peru, the nearest station, is not exceptionally good. A recent estimate indicates that some 150 receiving sets are in use, largely American, with some British and German sets. Short-wave reception has met with some success, only short-wave sets at present being sold. There do not appear to be any alternating-current receivers in use. Central-station service is mostly 110-volt, 60-cycle alternating current, but 120 volts is also common, as are frequencies of 40 and 50 cycles.

FALKLAND ISLANDS

Language, English; area, 4,618 square miles; population, 3,510

Because of the great distance from any broadcasting, and that in Spanish, the British Falkland Islands have shown little radio progress. The population is small. Summers are warm and winters cool, reception being poor. About 15 receiving sets are in service, all being of British origin. There is no broadcasting in the islands, and South American stations are received only with difficulty.

FRENCH GUIANA

Language, French; area, 32,000 square miles; population, 44,202

Practically no radio progress has been made in French Guiana. About eight sets are in use, all French. No broadcasting is available for satisfactory reception. All seasons are hot. The only central station provides direct current only, so alternating-current sets can not be used. Short-wave reception has not been developed.

PARAGUAY

Language, Spanish; area, 172,000 square miles; population, 791,469

The principal city of Paraguay is Asuncion. The country is mainly flat. Reception is best from May to September, but from November to March it is seldom possible. Summers are hot and winters warm, with poor receiving conditions.

About 150 receiving sets have been installed. These were purchased through Argentine sources and are of varying origins. One broadcasting station has operated for more than three years in Asuncion, and several Argentine stations are received. No regulations have been adopted, since radio has been little known.

Central-station service is mostly 220-volt, 50-cycle alternating current. Alternating-current receivers have not been introduced, nor are short-wave sets in evidence outside the class interested in "tinkering" with radio.

PERU

Language, Spanish; area, 533,916 square miles; population, 5,500,000

Peru has shown great interest in radio developments, and the country has advanced in this respect beyond some other South American countries where the conditions and the agreements which the Government entered into to secure broadcasting facilities have somewhat retarded progress. Yet the general popularity of radio in Peru has not been seriously checked by these drawbacks. The principal cities are Lima, Arequipa, and Callao. The surface is rugged and mountainous except for a narrow coastal strip. Climatic conditions are not conducive to good reception. The best reception is between July and September. Fair reception may be had from May to October.

A monopoly at one time reserved to the grantee the sole right to broadcast and to deal in radio apparatus. This firm collected license fees from the owners of receiving sets. Being controlled by British interests, it preferred to sell British goods, but since the terms of its concession required that 40 per cent of the material sold be purchased in the United States, the imports were so divided. The buying public, however, demanded American apparatus. After the first American quota had been exhausted and only British materials remained for sale, considerable discontent with the arrangement was shown. Discontent was fomented by dealers who had been unable to make terms with the broadcasting company for the retailing of the apparatus. The Government revoked the concession and in its stead placed the concessionnaire in charge of broadcasting, which became a function of the Government. The receiving license fee is about $4 annually.

Some 18,200 receiving sets are in service, about 70 per cent being American. British, Swedish, and Dutch tubes and sets are also being marketed. There are three broadcasting stations, two being in Lima. No foreign stations can be satisfactorily received. Very few alternating-current receivers have been put into service. Central stations provide 110-volt, 60-cycle alternating current at Lima, but elsewhere both voltage and frequency vary. Short-wave sets are popular, particularly those with changeable coils to work both short and long waves.

SURINAM

Language, Dutch; area, 54,291 square miles; population, 142,896

Radio development in Surinam has been almost negligible, and it is to be doubted that the future will show any great improvement. The number of receiving sets has been reported as 18, of various origins. Broadcasting is not available in any satisfactory form. Caracas, Venezuela, and sometimes stations in northern Brazil and the West Indies can be picked up. Hot weather maintains throughout the year. Neither alternating-current nor short-wave receivers have been introduced.

URUGUAY

Language, Spanish; area, 72,153 square miles; population, 1,762,451

Uruguay has displayed exceptional interest in radio, and developments there have been much beyond what was to be expected from the existing conditions. The number of receiving sets is increasing rapidly, while broadcasting stations have been opened up in appreciable numbers. Most of the development has been restricted to the Montevideo area, which has the only concentration of population. Further developments appear certain.

The surface of Uruguay is hilly and the climate good for radio, the best season being from April to October.

Radio is under the control of the division of radio communication service. There are no exceptional restrictions on broadcasting. Receiving is freely permitted.

About 17,150 receiving sets are estimated to be in use. American sets are the most popular and in the greatest number, but a number of British and German sets are also in service.

There are now 26 broadcasting stations in Uruguay, all but seven being in Montevideo; Argentine and Brazilian stations are received regularly.

Alternating-current receivers are in use and have generally proved satisfactory. Short-wave reception from the United States is popular. Central-station service is generally at 220-volt, 50-cycle, alternating current, and 220-volt direct current.

VENEZUELA

Language, Spanish; area, 393,976 square miles; population, 3,026,818

Radio developments in Venezuela have not been as great as they might have been because of the number of factors retarding the increase of the number of listeners. Climatic conditions are not of the best, and the high receiving-license fee would appear to be prohibitive. The concentration of wealth, however, prevents the license fee

from restricting the number of listeners, as those who can afford receiving sets can easily afford this fee.

The principal cities are Caracas and Maracaibo. With the exception of the Orinoco Valley, the country is mountainous. The climate is hot and the humidity is high; radio reception from distances is poor.

Radio is regulated by the Ministry of the Interior, which at one time granted a monopoly giving the concessionnaire the sole right to broadcast and to manufacture, import, and sell radio apparatus, but this was recently revoked. At present it is necessary to secure a permit prior to placing the order, from the Ministry of Interior, for each importation. It is understood that these permits are freely granted. Receiving licenses cost 5 bolivars per month, the proceeds going for the support of broadcasting. About 2,000 receiving sets have been installed. Nearly all are of American origin, though British and Dutch sets are also to be found.

A broadcasting station was established on May, 1926, at Caracas, but operation has since been suspended. Short-wave reception has interested a limited part of the listeners. For the present long-wave reception is impossible. It is thought that alternating-current receivers will be preferred to battery types by future purchasers. Central-station service in Caracas is 190-volt, 25 and 50-cycle alternating current. Elsewhere 110-volt, 60-cycle alternating current is general.

EUROPE

ALBANIA

Language, Albanian; area, 17,374 square miles; population, 831,877

Albania has few conditions which would encourage the development of radio. Summers are hot and winters cool. Reception is good only from October to May. A broadcasting station in Tirana has been reported. Yugoslavian and Italian stations are most easily received. Only 12 receivers have been reported in service, all of German origin. No use of alternating-current or short-wave receivers has been reported.

AUSTRIA

Language, German; area, 32,369 square miles; population, 6,526,661

Austria, despite restrictions, has a high degree of radio development. The climate is good for radio, and, although there is a considerable concentration of wealth, the poorer classes are generally able to afford small receivers. The license fee somewhat restricts this development, however. The populace generally is greatly interested, and broadcasting service from the several Austrian stations and those in neighboring countries using the German language provides a plentiful choice of programs for Austrian reception.

The capital and largest city, Vienna, has a population of about 2,000,000. The country is for the most part mountainous, and the climate is extremely varied, owing to the differences in altitude. The mean annual temperature at Vienna is 40° F. The summers are warm and the winters cold. Radio reception is good in most sections, the season of best reception being from October to March.

A broadcasting monopoly has been granted in the Oesterreichischer Radioverkehrs Aktiengesellschaft, a broadcasting company. This company is controlled by the State, which owns 60 per cent of the stock. Its activities are supported by the proceeds from receiving license fees, the amount of which depends upon the use to which the set is to be put and the income of the licensee.

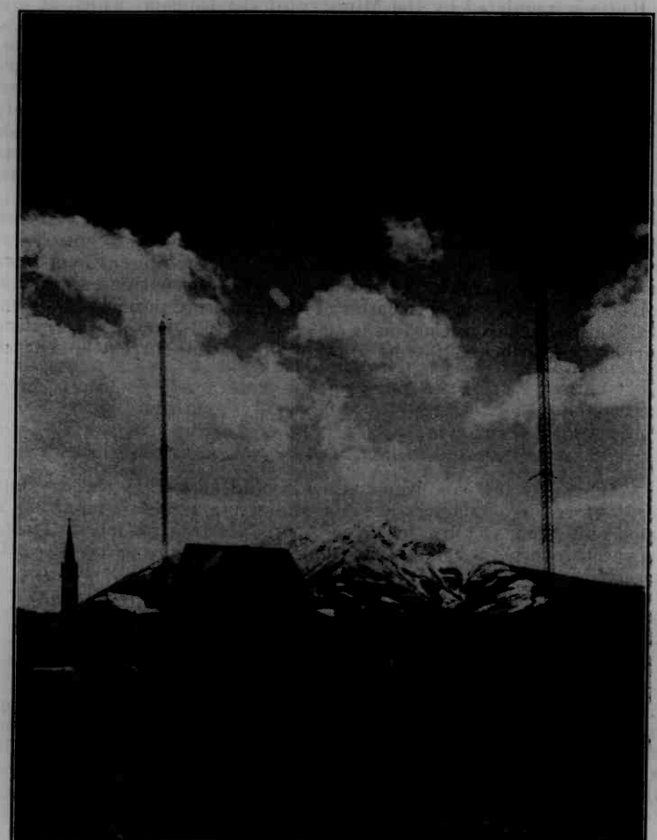

FIGURE 2.—Broadcasting station at Innsbruck, Austria

Control over all activities is maintained through a system of licenses which include broadcasting and receiving, importing, manufacturing, and merchandising. Persons holding a regular license may import radio equipment, but all others must secure a special license for that purpose. Receiving licenses cost 2 schillings ($0.28 in United States currency) per month, but if the licensee's annual

income exceeds 8,400 schillings, the fee is 6 schillings per month. Records of all sales must be kept; these are subject to inspection at any time. Merchants are held liable for sales made to persons not licensed to possess radio apparatus. In addition to duty, there is a 5.5 per cent turnover tax which is collected by the customs authorities.

An estimate of the number of receivers, licensed and unlicensed, places the figure at 371,011. Practically all are of Austrian and German manufacture, but a number from various other countries are also in use. American receivers are practically excluded by patent restrictions.

Austria has six stations of which two are in Vienna. One is a short-wave transmitter. Broadcasting from several neighboring countries is received, language making that from Germany particularly valuable.

Alternating-current sets are showing increased popularity. Both 110 and 220-volt central-station services are general, 42 and 50 cycles predominating. Short-wave reception is common only to a few enthusiasts. There is little short-wave broadcasting in Europe, and the hours of American broadcasts are inconvenient.

AZORES

Language, Portuguese; area, 922 square miles; population, 242,613

Although the Azores are situated a great distance from broadcasting of any kind and have comparatively poor reception conditions, radio has proved popular, and a number of sets have been installed. The Azores, lying about 900 miles off the coast of Portugal, are politically part of the Portuguese Republic. Being of volcanic origin, these islands are mountainous and rugged. The climate is warm and equable; frost is unknown, the temperature ranging from 50° to 73.5° F. Radio reception is fair in any season and is best from September to April.

There are no restrictions on the use of receiving sets. According to a recent estimate, radio installations number about 200. A large percentage of receivers are of American origin, but the majority appear to be British. No broadcasting has been done in the Azores, but stations in Spain and Portugal are received without great difficulty. The wave lengths of stations received range from 200 to 3,000 meters.

Only one or two alternating-current receivers are in use, battery sets appearing to give better service at the distances over which receivers must be capable of operating. There is no information as to the use of short-wave sets or adapters, but they should be popular for use under prevailing conditions.

BELGIUM

Language, French; area, 11,752 square miles; population, 7,923,077

Belgium has a high degree of radio development, but it has been retarded by a number of factors. Postwar financial conditions have at times practically abolished the business of radio dealers, but the popularity of broadcasting has served to restore it as soon as prospective purchasers were able to afford the investment. Develop-

ment in the construction of broadcasting stations has been slow, but this is largely made up by the great number of high-powered stations in neighboring countries.

Brussels, Antwerp, Liege, Ghent, and Mechlin are the principal cities. The northern portion consists of lowlands, which slope to a plateau in the south. The climate is conducive to good radio reception, being similar to that of England. The mean annual temperature is 50.6° F., the mean maximum being 57.2° and the mean minimum 44°. The average annual rainfall is 28.4 inches, but varies considerable in different regions, ranging from 27 to 40 inches a year. Radio reception is good at all times except during the months of June, July, and August, and it is fair even then.

Regulations require that an installation fee and a receiving license fee be paid by owners of receiving sets. Regenerative sets are prohibited. No exceptional restrictions on importing, merchandising, or manufacturing are imposed.

Besides 11 broadcasting stations in Belgium, those in the United Kingdom, France, Germany, the Netherlands, and other countries are received. Statistics indicate that 63,125 licensed installations are in service. French, Belgian, British, and German sets predominate. There is a certain demand for alternating-current receivers. Short-wave sets and adapters are also popular. The prevailing central-station service characteristics are 220 volts, 50 cycles, alternating current.

BULGARIA

Language, Bulgarian; area, 39,824 square miles; population, 5,596,800

Radio has been discouraged in Bulgaria to the point that there is practically no development. There is yet no indication of any appreciable advancement during the next few years. All means of communication such as railways, telephones, telegraphs, and wireless stations are monopolies of the Government. There is no market for apparatus in Bulgaria. Most of the few sets in operation have been brought in by members of the diplomatic corps. The summers are hot and the winters cool. Radio reception is good throughout the year. Radio is administered by the Ministry of Posts and Railways. Receiving licenses costing 200 leva ($1.44 in United States currency) per year for private homes are required. For other places the fee ranges up to 15,000 leva ($110) per year. The penalty for operating a receiving set without a permit is solitary confinement for a period not exceeding one year and a fine of up to 5,000 leva. Licenses for 1,612 sets have been issued, the sets being mostly Austrian and German. Bulgaria has no broadcasting. Reception from neighboring countries is easily accomplished, but language difficulties prevent it from being particularly desirable.

CZECHOSLOVAKIA

Language, Czech, German, and Slovak, and some Hungarian and Ruthenian; area, 54,195 square miles; population, 14,523,186

Czechoslovakia has a high degree of radio development. The Government early adopted an encouraging attitude, and as a result the broadcasting structure is one of the best in the world. The people

have found radio interesting and the programs desirable, with the result that a great number of receiving sets have been installed. The climate is good for reception, and the national wealth is so distributed that few people are unable to afford receivers. It is expected that the high rate of advancement that has been carried on for the last few years will continue for some time. The principal cities are Prague and Brunn.

Radio broadcasting is under the Ministry of Posts and Telegraphs, which controls the company having the broadcasting concession. Theoretically individual concessions may be granted to other companies, but none have ever been favorably received. Broadcasting is supported by subscription collected from receiving-set owners. This subscription is 10 crowns ($0.30 in United States currency) per month after the first month, for which no fee is assessed. Licenses are granted to Czechoslovak citizens and to the nationals of other countries which grant the same or greater privileges to Czechoslovak citizens. Importing is prohibited except under license, which is granted for 5 per cent of the value of the shipment. Duty is collected in addition.

Receiving sets in use number about 300,000; 266,333 of which were licensed October 31, 1929. Crystal sets are efficient in most parts of the country and constitute a large proportion of the total in use. Domestic manufacturers supply most of the needs of the market, but some German makes are popular.

Five broadcasting stations are scattered through the country, while Austrian, German, Polish, Hungarian, and other stations are easily received. One of the two in Prague broadcasts on short waves.

Alternating-current receivers are becoming popular, as is equipment for short-wave reception. Both 110 and 220-volt lighting service is provided, mostly at 50 cycles.

DANZIG

Language, German; area, 754 square miles; population, 386,000

The Free City of Danzig has displayed a great interest in radio, and developments have been comparatively great. Danzig is situated on the Baltic between the Polish "corridor" and Prussia. Its climate is favorable to radio reception, being best from September to May, although there is considerable difficulty from ship-wireless interference.

Receiving is permitted under license, special permits being required for sets capable of receiving over 700 meters. Some market for sets limited to 700 meters is thus created. A fee of 2½ (Polish) zloty per month (about 28 cents in United States currency) is charged for licenses. A luxury tax of 10 per cent is levied on receiving sets.

Although broadcasting is forbidden by law, a station is operating in Danzig, in conjunction with the German system. Stations in the Baltic States, Poland, Germany, and the Scandinavian countries are received. It is estimated that 155 receiving sets are in use, practically all German.

DENMARK

Language, Danish; area, 17,110 square miles; population, 3,434,555

Interest in radio broadcasting has been high in Denmark, and developments have been encouraged by the Government. The distribution of wealth is such as to enable almost every family desiring radio to purchase a receiver. The climate is excellent for reception, and, although there are no neighboring countries employing the Danish language the similarity of other Scandinavian tongues to Danish and the custom of educating children in German have increased the popularity of foreign stations received in Denmark.

Copenhagen, Aarhus, Odense, and Aalborg are the principal cities. About 57 per cent of the population is rural. The territory is low and undulating. The climate is in general cold and inclement, though somewhat mild in the southern islands. The mean annual temperature at Copenhagen is 46.8° F. and the rainfall 21 inches. Radio reception is good throughout the year but is best from September to May.

Radio is governed by the State Radio Council. Broadcasting is a State monopoly and is supported by the listeners through the medium of a 10-crown annual license fee. No restrictions, excepting the license requirements, have been imposed on the owners of receiving sets. Manufacturing, importing, and merchandising are permitted without restraint.

Four stations are recorded as operating in Denmark. One of these employs short waves. Additional service is obtained from Norwegian, Swedish, German, and British stations.

Receiving sets in use to the number of 343,000 have been licensed; about one-half of these are crystal sets. Domestic manufacturers supply most of the demand. British sets are also popular, and a number of American sets are in use. Socket-power receivers are becoming increasingly popular, about 90 per cent of sales being of this type. Short-wave reception likewise is arousing considerable interest. Central-station service is mostly at 220-volt, 50-cycle alternating current.

ESTONIA

Language, Estonian; area, 18,355 square miles; population, 1,110,538

The development of radio in Estonia has been especially high, considering the difficulties. Reception conditions are excellent, but the distribution of wealth is not such as to make it possible for every family to afford radio receivers. The people have become particularly interested in radio, however, and any improvement in general conditions is almost certain to result in increased use of radio. Perhaps the greatest aid in the promotion of radio activities has been the encouraging attitude of the Government.

Estonia is a flat country bordered by Soviet Russia and Lithuania. It lies east of the Baltic Sea and south of the Gulf of Finland. The capital and principal city is Tallinn, formerly Reval. The language of the country is Estonian, but German and Russian are universally used and understood. The mass of the people are of the peasant class, without high standards of comfort, but the percentage of illiteracy is very low.

The climate is variable, the winters being severe and the summers hot and dry. Radio reception is good throughout the year, especially from September to May. Permits to install receiving sets are required. An annual fee of 9 Eesti krona ($2.40 in United States currency) for crystal sets, 12 Eesti krona ($3.20) for one and two tube sets and 15 Eesti krona ($4) for larger tube sets are assessed. The charge, however, is based on the antenna, and two or more sets on one antenna may be legally used under one license, provided the license covers the set which would pay the highest tax. Two broadcasting stations are operating in Tallinn, and one in Tartu, while Finnish, Latvian, Lithuanian, Russian, Polish, German, and Scandinavian stations are received. Alternating-current receivers are attaining a certain degree of popularity. Short-wave sets have been introduced for some time and seem to be in fair demand. The

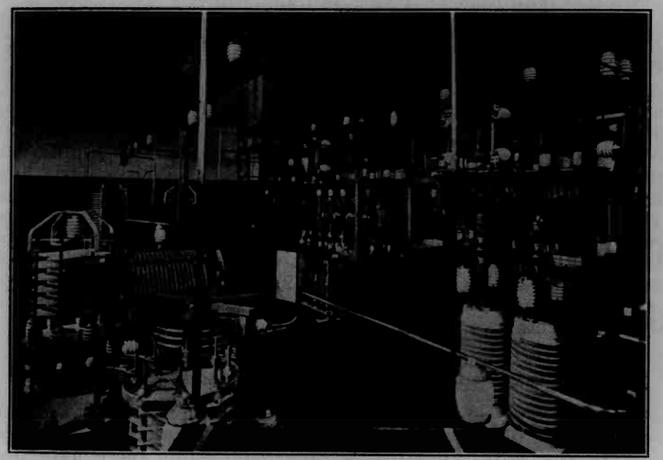

FIGURE 3.—A transmitter of Russian manufacture in use at Tallinn, Estonia

preponderance of central-station service is provided at 220-volt, 50-cycle alternating current.

Licensing statistics show that 14,426 receiving sets are in use. About 6,000 of these are tube sets, only 200 being of the socket-power type. Crystal sets account for approximately 8,500. There is no estimate covering illegally operated receivers. Domestic sets are in the majority, and German, British, and American to a fair extent. Very few short-wave sets are in use.

FINLAND

Language, Finnish; area, 149,641 square miles; population, 3,582,406

The development of radio broadcasting and receiving is well advanced in Finland. The population appears to be greatly interested, and the Government has done much to promote broadcasting. The climate is exceptionally good for receiving, and the distribution of

wealth appears to be sufficiently extensive to permit all interested people to purchase suitable receivers. The distribution of broadcasting stations is likewise such as to be conducive to good service. The principal cities are Helsingfors (Helsinki), Abo (Turku), Tammerfors (Tampere), Viborg (Vipuri), Wasa (Waasa), Uleaborg (Oulu), Kuopio, and Bjorneborg (Pori). The name given in parentheses in each case is the Finnish name, the Swedish being given first. The country consists of low plains, broken by occasional low hills and ridges. Nearly 80 per cent of the total area is forest and 12 per cent lakes. The winters are severe, the summers hot and dry. Finland has a more temperate climate than any other country in the same latitude, the mean annual temperature being 34° F. and the average annual rainfall 14 inches, although at Helsingfors it is about 20 inches. Radio reception is good during all seasons, with noticeable improvement during fall and winter.

Broadcasting is provided by seven stations scattered through the populous areas. Swedish, Russian, and Baltic stations are also received satisfactorily.

A receiving license fee of 100 Finnish marks ($2 in United States currency) per calendar year is required. Some 90,232 receiving sets are licensed. About 30 per cent are of local manufacture, crystal sets amounting to about one-third of the total. Germany supplies most of the remainder, with Swedish and Dutch sets used in fairly large numbers. Alternating-current receivers are now demanded by urban purchasers. All European programs are available on long waves, and the time that American short-wave programs are receivable begins at midnight or after. Short-wave reception has not made much progress. Lighting service at 220 volts, 50 cycles is provided in most places, but some variation is noted. Helsingfors has 120-volt direct current.

FRANCE

Language, French; area, 212,659 square miles; population, 40,745,874

France is one of the most advanced countries in the world in respect to use of radio. The climate is good for receiving. The people are especially interested in radio, and while there have been financial difficulties preventing a large percentage of the people from investing in receivers, the large population and the fairly even distribution of wealth have promoted the use of radio beyond the proportions maintaining in other countries under similar circumstances. The Government has interested itself in promoting broadcast service, for the Government chain of stations has provided a foundation for the broadcasting system which serves the entire country.

The principal cities of France are Paris, Marseille, Lyon, Bordeaux, Lille, and Strasbourg. The surface generally is flat, but there are border mountain ranges on all of the frontiers except the Belgian and German.

The climate of the different sections varies widely. In the south radio reception is good only during a limited season, while in the north, reception is always good except during the hottest part of the summer. The best reception at Paris is from September to May. Paris has 150 rainy days a year, the total precipitation amounting to about 24 inches. The mean annual temperature is about 50° F.

Broadcasting is permitted by French citizens only. Permits are granted sparingly, apparently to prevent congestion and to guarantee the placing of permits in the hands of organizations qualified to present the best programs.

Broadcasting is supported by the organizations operating the stations. While there is no monopoly, the majority of the stations are owned by the Government and rigid control is exercised over other stations. A reduction of the number to 15 stations of high power has been proposed and will probably be adopted. The project provides for receiving license fees to be continued, and advertising time sales to provide the necessary funds. There are 31 stations well distributed over France, broadcasting on short waves, including 5 which use two or more waves. It is stated that foreign programs are preferred to the French. Various areas receive broadcasts from all parts of Europe.

Receiving set owners are assessed 10 francs annually, the receipt serving as a license. A luxury tax of 12 per cent on sets costing more than 500 francs and on parts costing more than 50 francs was instituted in January, 1926.

Receiving-set license statistics are not made public, but various estimates indicate some 1,500,000, receivers to be in use. Domestic manufacturers supply nearly all of the demand, with British, German, Swiss, and American sets used in small numbers. French equipment is also exported in considerable quantities to Belgium, Spain, Great Britatin, and Italy. South American markets are also receiving considerable attention. A patent pool was found late in 1929, controlling the principal radio patents. It is understood that licenses to import sets or to sell imported sets under these patents will not be granted.

Alteranting-current receivers have been introduced with moderate success. Short-wave receivers are not exceptionally popular. Central stations in France show little uniformity in current characteristics, no particular combinations prevailing.

GERMANY

Language, German; area, 180,976 square miles; population, 62,348,782

Germany has a well-advanced development of radio. The broadcasting system sponsored by the Government includes stations in all parts of the Republic, and additional ones are being opened regularly. The purchasing power of the people is generally good, and most families are able to afford a set capable of receiving some one or more of the national stations. The climate is good for receiving, being generally the same as in the southern part of Canada. The people have taken considerable interest in radio and have installed receivers in great numbers.

There are 45 cities in the Republic with populations in excess of 100,000, Berlin and Hamburg both running into millions. The central and southern portions of the country are mountainous.

The climate is temperate and uniform. In the lowlands the mean annual temperature varies from 49° to 52° F. Rainfall is greatest in the Harz Mountains, where the precipitation often exceeds 45 inches per year. The average for the plains regions is 20 inches.

Radio reception is generally good, the season of best reception being from September to May.

Radio broadcasting is under the control of the Government, which owns the equipment of all stations. Broadcasting is done by corporations which have monopolies in each section of the country. These corporations are supported from the proceeds of license fees.

FIGURE 4.—Berlin's funkturm (broadcasting tower), 130 meters (426 feet) high. Transoceanic programs are sometimes sent from this aerial

Under a program of reorganization of the broadcasting system, relay stations are to be discontinued and main stations replaced with others of higher power. Two stations of 60,000 watts (Heilsburg and Muehlacker) are under construction, and are expected to be in service before January 1, 1931.

There are 28 broadcasting stations in Germany. Four short-wave stations are in operation, one using simultaneous long wave. Reception is satisfactorily accomplished from all parts of Europe, Germany being the geographical center of broadcasting on the Continent.

Cheap labor permits German manufacturers to supply the domestic market with sets at very low prices, which reacts unfavorably upon the demand for imported apparatus. The good distribution of broadcasting stations makes cheap sets quite satisfactory. Rigid control of patents by a dominating manufacturer is exercised.

Receiving licenses are granted freely to all applicants except Russians, Poles, and Slovaks. A fee of 24 marks ($5.71 in United States currency) per year is enacted, for which a person is entitled to own and operate as many receiving sets as desired, provided not more than one is in use at any one time.

Receiving-set license statistics show some 3,066,682 authorized, while an additional number, variously estimated, are operated without authority. Nearly all of the sets in use are of German origin, but American and British sets are also in use. Alternating-current receivers are popular, as are short-wave receivers and adapters. Central-station service is about evenly divided between 110 and 220 volts, mostly 60-cycle alternating current.

GIBRALTAR

Language, English; area, 2 square miles; population, 18,061

Radio has been restricted in Gibraltar by a number of conditions, including the great amount of interference from ship stations and the land stations on the Rock. The climate is highly conducive to static. The people generally are interested in broadcast reception, and any improvement in receivers which will permit the reception of Continental stations through the interference should prove popular.

There is no broadcasting in Gibraltar, stations in Spain being most easily received. Reception from the United Kingdom is not unusual. Receiving is permitted without any restrictions except for a 10-shilling license fee collected each year. It is estimated that about 150 receivers are in use in Gibraltar. All of these are believed to be of British origin. Alternating-current receivers are practically useless. Short-wave receivers and adapters are becoming increasingly popular.

GREECE

Language, Greek; area, 49,022 square miles; population, 6,200,000

The restrictive attitude of the Government, maintained until 1926, has limited the development of radio in Greece. The climate is not especially good for reception, and the people are not greatly interested in radio.

Greece is a country that is much broken up, owing to the fact that it consists of a range of partially submerged mountains. Athens, Saloniki, Patras, and Corfu are the principal cities. Greece has hot summers and cold winters; the rainfall is great in some sections. Radio reception is good only from November to February.

Broadcasting is prohibited, but the Government has indicated its intention of creating a broadcasting monopoly as soon as the necessary arrangements can be made. Reception is permitted, under certain restrictions, to Greek citizens, but is prohibited to foreigners. Licenses are required, for which 500 drachmas ($6.50 in United States currency) must be contributed for the benefit of the navy.

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Recent estimates indicate about 1,000 receivers to be in use. These are of various origin, particularly American, British, and German.

Greece has no broadcasting, nor is there any in neighboring countries, except the Osmanie station in Turkey, which is at some distance.

Alternating-current receivers have been introduced, but have not yet made much headway. Short-wave reception is not exceptionally popular, since no short-wave broadcasts in Greek are available.

HUNGARY

Language, Magyar; area, 35,901 square miles; population, 8,368,273

While the ownership of receiving sets in Hungary is limited to a proportionately small part of the population, broadcast reception has proved popular and a large number of receivers have been installed. The Government has passively encouraged the use of radio. The climate is good for reception. Owing to the country's position, it is believed that stations in a greater number of countries can be picked up on a given set in Hungary than in any other country. The people are generally interested, and improvement in individual purchasing power of the poorer classes would be almost certain to result in an increased sale of less expensive sets.

The principal cities are Budapest, Szeged, and Debrecen. The surface is mostly flat, though mountains occur in some of the areas adjacent to frontiers. The climate is mild, the summers being warm and the winters cold. There is great variation, however, between different sections.

Radio is under the control of the postal administration, which holds a monopoly on broadcasting through a broadcasting corporation. Stations are supported by proceeds from license fees. Licenses for receiving are issued to all applicants and cost 2½ pengos (45 cents) per month when the set is to be used only for amateur receiving. Higher fees are charged for sets to be used for business purposes. Government inspection and supervision of all sets is required. Manufacturing, importing, and merchandising of radio apparatus are subject to permits issued by the Ministry of Commerce and are under the supervision of the postal authorities.

The only broadcasting station is at Budapest. Considerable dependence is placed on stations in neighboring countries.

Hungary has about 240,000 receivers in use, principally of German and Dutch origin. American sets are preferred, but are too costly when adapted to the high European wave band. Short-wave reception is also arousing interest. Central-station service is provided in 110 and 220 volts, with variations of frequency, mostly 50 and 60 cycles. Socket-power sets have almost completely supplanted battery sets in sales.

ICELAND

Language, Icelandic; area, 39,709 square miles; population, 103,817

Though somewhat isolated by distance, radio has been popular in Iceland ever since the installation of the first sets demonstrated the feasibility of receiving programs broadcast in Denmark, the United Kingdom, and other countries. Since then developments have been fairly rapid.

All but a very few of the inhabitants live in Reykjavik, the chief city. The surface is mainly ice-covered plateaus, with numerous lakes and crater basins. Glaciers cover about 5,000 square miles. There are a number of active volcanoes.

Iceland has two broadcasting stations, at Reykjavik and Akureyri. Scandinavian and North American stations are also received.

The number of receivers in use is estimated at about 50. These are largely of German manufacture. Alternating-current receivers have not yet been introduced. Short-wave reception is popular.

IRISH FREE STATE

Language, Gaelic and English; area, 26,592 square miles; population, 2,972,802

Radio is very popular in the Irish Free State. The attitude of the Government has been one of great encouragement. The climate is exceptionally favorable to broadcast reception, and although there is some interference from ship stations operating in code in the areas near the coast, such interference is at a minimum. There is little difficulty from static.

The principal cities of the Free State are Dublin, Cork, Limerick, and Waterford. The Free State is an undulating plain broken toward the north and west by groups of low hills. A large portion of the total area is occupied by lakes.

The mean annual temperature of Dublin is 50° F., and the rainfall is 40 inches. The season of best reception continues from September to May, but reception is good during the remaining three months.

Broadcasting is a Government monopoly and is supported by licenses. The receiving regulations are very moderate. Licenses are required, however, these costing 10 shillings ($2.43) a year, as in the United Kingdom. There are no exceptional restrictions on manufacturing, importing, or merchandising. The two stations in the Free State and those in the United Kingdom provide satisfactory broadcasting services.

Licensed sets number about 26,000. British sets predominate, but American and German receivers are used in large numbers.

Alternating-current receivers have aroused a great degree of interest. The prevailing current characteristics are 220 volts, 50 cycles, alternating.

ITALY

Language, Italian; area, 119,744 square miles; population, 40,796,000

Italy has shown increased rate of broadcast development during the past few years. Formerly the restrictions and prohibitions imposed by the Government, although intended only for the protection of broadcasters and the service in general, served to arrest development, while the several charges made against the owners of receiving sets were such as to eliminate a large number of people who otherwise would have been prospective purchasers of receivers. This condition no longer exists to the same degree, so that Italy is rapidly becoming one of the leading countries of Europe in broadcast development.

The principal cities are Milan (Milano), Naples (Napoli), Rome (Roma), Turin (Torino), Palermo, and Genoa (Genova). The country has a central mountain range, which slopes to plains along each coast, the southern portion being almost entirely plains.

The climate is generally warm. Temperatures and rainfall vary for different regions, since both latitudes and altitudes vary greatly. At Rome the radio-receiving season extends from November to June.

Radio broadcasting is under the control of the Ministry of Communication. A monopoly for broadcasting has been granted to the Ente Italiane per le audizione Radioqoniche (E. I. A. R.), a corporation organized for that purpose. Licenses costing 3 lire (15 cents) per year are required for the operation of receiving sets, the proceeds accruing to the national treasury. Subscriptions to broadcasting service are compulsory, the funds received being used for the

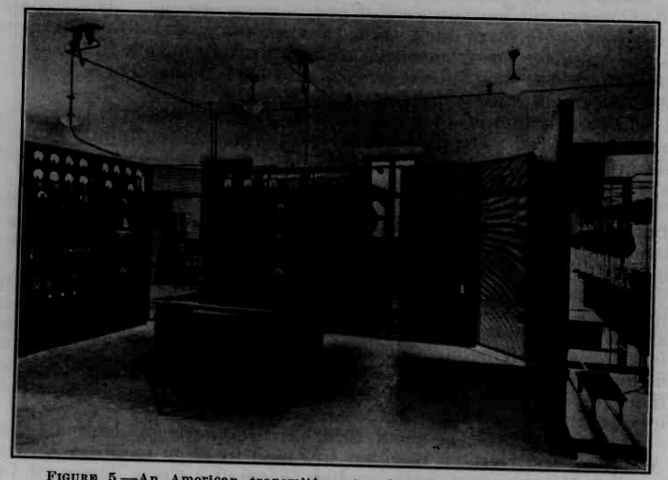

FIGURE 5.—An American transmitter at a broadcasting station in Italy

purpose of supporting broadcasting stations and providing programs. Listeners are required to pay 72 lire (about $3.80) per annum for this service, but receivers employed for commercial purposes are assessed at varying rates, sometimes as high as 1,500 lire ($80) per annum. The search of homes and other places for illegally operated sets is authorized.

Italy has six broadcasting stations, including one short-wave transmitter, and a certain amount of broadcasting service from neighboring countries.

No set may be installed unless approved by the Ministry of Communications. Samples of sets may be deposited by manufacturers and importers as a check against adherence to types in lieu of individual inspection of sets, which is otherwise required. A sales tax is assessed at the following rates: Tubes, 6 lire ($0.32); crystal sets, 12 lire ($0.65); loud speakers, 24 lire ($1.25); tube sets, 53 lire ($2.80).

Some 250,000 sets are reported to be in service. A majority are of Italian manufacture, but many American, French, and German sets are in use. Alternating-current sets are being sold almost to the complete exclusion of battery sets. The voltage and frequency of central stations vary considerably. Short-wave reception is popular to a certain degree, but because of the lack of short-wave broadcasts in the Italian language, has a limited field.

LATVIA

Language, Lettish; area, 40,856 square miles; population, 1,870,520

The development of radio in Latvia has been at a rather high rate. The people are interested in radio, and though the purchasing power of a majority of the population is too low to enable them to afford receivers, the remainder are in sufficient number to make a comparatively good market. The Government has adopted an attitude of general encouragement.

The principal cities are Riga, Libau, Dvinsk, Mitau, and Windau. The climate is similar to that of New York State, and radio reception is good, being best from September to May. However, there is considerable interference along the coast from ship stations. The country is mainly a low plain.

The Post and Telegraph Administration controls radio broadcasting through a monopoly. Receiving licenses are required, costing from 1 ($0.19) to 20 ($3.80) lats per month, the fee for receivers in homes being 2 lats ($0.38). The fee is reduced by 50 per cent for the months of June, July, and August. Permanent permits costing 1 lat are issued to blind persons, disabled veterans, and educational institutions and asylums. A higher rate is assessed on sets to be used commercially. Regenerative sets are prohibited, and government inspection of each installation is required. Fundamentally, manufacturing, importing, and merchandising are government monopolies, although concessions are made. Only such apparatus as does not compete with Latvian manufacturers may be imported. All sets of less than four tubes are under this ban.

There is one broadcasting station at Riga. Additional service is provided by stations in Lithuania, Estonia, Russia, Finland, Sweden, Poland, Germany, and Danzig.

The number of sets licensed totals 30,000. About 70 per cent are crystal receivers. Domestic sets predominate. Alternating-current receivers have supplanted battery-type so far as the demand for new sets is concerned. Lighting-current supply is mostly 220 volts, 50 cycles.

LITHUANIA

Language, Lithuanian; area, 20,550 square miles; population, 2,011,173

The development of radio broadcast and reception in Lithuania is well advanced. The people generally are deeply interested in radio, even though only a small part of the population is able to afford receiving sets. The Government encourages the use of radio. Since the population is largely of foreign nationality, broadcasting

in all neighboring countries has considerable value in Lithuania. The principal cities are Kovno, Memel, Vilna, Grodno, and Suwalki. The country is an undulating plain. The climate is temperate and very favorable to radio reception through the year, especially from September to May. Radio is administered by the Post and Telegraph Administration. Receiving licenses are issued through the postal system; the cost for sets in homes is 100 lits ($10) per year and for commercial establishments 1,000 and 2,000 lits ($100 and $200) per year. Other fees for various other purposes are charged.

The charges for the registration and stamping of radio apparatus are:

	Lits		Lits
Tube receivers, per tube	5	Block condenser	0.50
Crystal sets	5	Variable condenser	3
Tubes	1	"B" batteries of less than 100 volts	2
Headsets	3		
Loud-speakers	10		

Receiving subscriptions of 1 lit per month (in villages) and 2 lits per month (in cities) for crystal sets and of 3 and 5 lits for tube sets is also charged with much higher rates for sets used in commercial institutions. Reception is permitted under a system of licenses. All citizens are permitted to obtain licenses without preliminary arrangements, but foreigners are required to first obtain special authorization from the Foreign Office. Importation and sale are also subject to license. All American equipment must bear Post and Telegraph Administration stamps.

The only broadcasting station is at Kovno. Stations in Russia, Finland, Estonia, Latvia, Germany, and the Scandinavian countries are received.

It is estimated that some 12,000 receiving sets are in use, mostly German. There are a few American sets. One or two alternating-current receivers have been put into service. Lighting service is principally 220 volts, 50 cycles. Short-wave reception is still the property of amateurs.

LUXEMBURG

Language, German; area, 999 square miles; population, 285,524

The development of radio is fairly well advanced. There are some 2,000 receiving sets in operation. One broadcasting station in the city of Luxemburg is in service, and programs from all neighboring countries are received. No alternating-current receivers or short-wave sets have been reported.

MADEIRA

Language, Portuguese; area, 314 square miles; population, 179,002

The climate in Madeira is very poor for reception, static difficulties being the principal retarding agency. The people are interested in radio, however, and a number of receivers have been installed. Future developments should show increased advancement. Estimates place the number of sets in use at 180. It is understood that these are nearly all British and American. There is no broadcasting in Madeira, nor none particularly satisfactory within reasonable receiving distance.

MALTA

Language, English; area, 122 square miles; population, 212,528

Radio has attained a fair degree of popularity in Malta. The chief city is Valetta. The surface is generally low and undulating. The summers hot and the winters mild. Radio reception is fair from November to March.

Broadcasting is prohibited. Reception is subject to permit from the lieutenant governor and to the payment of a license fee of 21 shillings for the first year and 10 shillings each subsequent year. There are no special restrictions on manufacturing, importing, or merchandising.

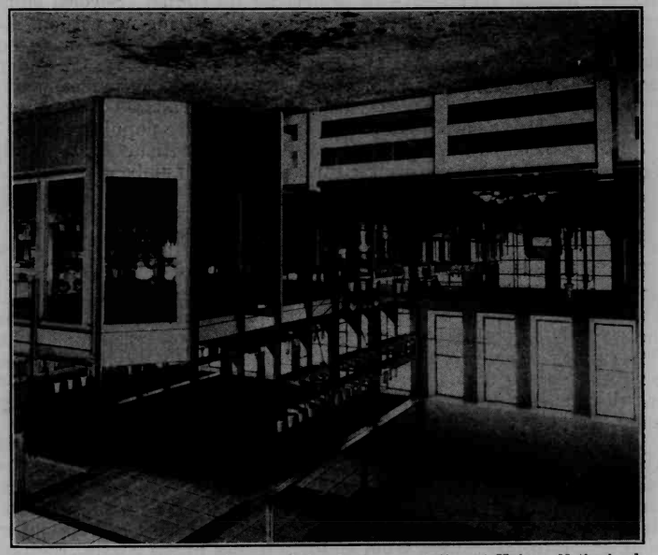

FIGURE 6.—Transmitting equipment of the short-wave station at Huizen, Netherlands

Receiving sets number about 250. None of these is of the alternating-current type so far as can be learned. Short-wave sets are popular, and this popularity is increasing.

NETHERLANDS

Language, Dutch; area, 13,205 square miles; population, 7,625,938

The development of radio broadcasting and reception has been rapid since it was first introduced into the Netherlands. The Government has been active in encouraging its use. The people are interested in radio, and the general distribution of wealth has enabled almost everyone to purchase a receiver. Although there is considerable interference from ship stations operating in code, satisfactory reception is easy to accomplish. The climate tends toward great

extremes and is moist, the mean annual rainfall being about 28 inches. Reception is good from September to May and fair during the summer. The principal cities are Amsterdam, The Hague, Rotterdam, and Utrecht. The surface is low and flat.

Postal authorities must be notified of the installation of a set, but no fees are collected. Broadcasting is supported mainly by voluntary subscriptions from listeners.

Four broadcasting stations are operating in the Netherlands, one broadcasting on short waves. Programs from German, Belgian, French, and British stations are received regularly. Alternating-current receivers are rapidly supplanting battery sets.

A large Dutch firm which controls the principal radio patents has recently become very active in protecting its rights. Several suits were instituted against parties claimed to be infringing without license, and it is understood that the practice of licensing is to be discontinued. In this event, the Dutch market will be strictly under monopoly, and further importation of sets and equipment made impossible. Lighting service is usually at 220-volt, 50-cycle alternating current. Short-wave reception is unusually popular.

Some 152,000 receiving sets are in use. British, Netherland, French, and German sets are used in about equal numbers.

NORWAY

Language, Norwegian; area, 124,964 square miles; population, 2,649,775

The development of broadcast reception in Norway has been good, although until the last two years very little progress has been made. The climate is of the best for radio reception, and there is little in the way of mineral deposits to interfere with good reception. The Government has actively promoted the use of radio, and the people generally appear to be interested. The individual purchasing power and distribution of wealth are such that almost every family desiring to do so is able to purchase a receiving set.

The principal cities are Oslo, Bergen, Stavanger, Drammen, and Trondhjem. The surface is mountainous and broken by numerous valleys and fjords. The climate is tempered by the Gulf Stream, but the central and eastern portions have extremely cold winters. Radio reception, good throughout the year, is best from September to May. Rainfall ranges from 40 to 70 inches in the coastal regions and is about 16 inches in the interior.

The control of radio broadcasting is vested in the telegraph authorities. The use of radio by amateurs is prohibited. Broadcasting concessions for each part of Norway are granted to private broadcasting companies, which receive 16 crowns for each receiving license issued within their respective areas. After five years the stations will revert to the Government. The receiving-license fee of 20 crowns ($5.36) per year is collected from receiving-set owners, the proceeds being used to defray broadcasting expenses. A special Government authorization is required to import radio apparatus.

Eleven broadcasting stations are operating in Norway, one using short waves. Good reception from Swedish, Danish, and other European stations is usual.

Over 70,000 receiving sets have been licensed, and it is estimated that an additional 5,000 are illegally operated. American sets are

in little use. Norwegian manufacturers supply a large part of the demand, while Dutch and German sets are also used in considerable numbers. Alternating-curent receivers are in common use, and the number is constantly increasing. Lighting service is usually 220 volts, 50 cycles. Short-wave reception is popular.

POLAND

Language, Polish; area, 149,140 square miles; population, 30,212,962

The climate of Poland is good for radio reception throughout the year, and considerable progress has been made in bringing about increased interest in radio. The Government encourages its use, and the people have displayed more than ordinary interest in it. It is expected that developments of the next few years will show a

FIGURE 7.—A studio of the Polish Broadcasting Co. at Warsaw

considerable increase in the demand for receiving sets. The principal cities are Warsaw, Lwow, Lodz, and Cracow. The surface is entirely of plains. The climate is very good for radio reception, there being no season during which reception is seriously affected.

Radio broadcasting is administered by the Post Office Department. A broadcasting monopoly has been granted to the Polish Radio Co., two-fifths of the stock being held by the State treasury. A license fee of 30 zloty ($3.36) per year is required for amateur receiving sets.

Poland has five broadcasting stations and receives Russian, German, Austrian, and other European broadcasts.

Licensing statistics place the number of receivers at 202,586, of which about 80 per cent are crystal. Polish sets are in the greatest number, with some German, British, and American in use. Over 20 manufacturers are now producing radio equipment in Poland.

Some alternating-current sets have been sold. Various types of lighting service are provided. Short-wave reception is popular among a limited part of the listeners.

PORTUGAL

Language, Portuguese; area, 35,490 square miles; population, 5,628,610

Portugal has a poor climate for radio reception, together with further difficulties provided through mineral deposits over which transmission is difficult. Little interest has been aroused except in the vicinity of Lisbon, and it is expected that at least a few years will pass before developments will reach a stage comparable to other European countries. The principal cities are Lisbon, Oporto, Setubal, and Braga. The country is mountainous, with widely varying climatic characteristics within comparatively small areas, but it is generally hot in the south and cool in the north and very damp throughout. Reception is never very good in any section and is possible only between November and April. Ore deposits are thought to hinder reception seriously in the vicinity of Oporto.

There are no particular restrictions, but a 2 per cent tax is collected by the customs authorities in addition to tariff charges. Some 2,500 receivers are in service. These are of British, German, and American origin. The only broadcasting station is in Lisbon. Reception of Spanish programs is usual, but no reception outside of Lisbon and its vicinity is satisfactory.

So far as is known, no alternating-current receivers are in use. Lighting-service voltages and frequencies vary considerably. Short-wave reception has a limited popularity.

RUMANIA

Language, Rumanian; area, 122,282 square miles; population, 17,393,149

Broadcast reception in Rumania has been of little interest to the public, owing to the attitude of the Government and generally poor receiving conditions. The conditions under which the Government limited the use of radio have been largely overcome, and there now appears to be a hope for greater future developments. In general the situation is such as maintained in most countries during the early days of broadcasting. The country is largely a sloping plain, with temperature ranges from zero to over 100° F., the mean annual temperature at Bucharest being 50° F. The annual rainfall is 25 inches.

Broadcasting is a monopoly, granted to the Societa de Difuzione Radio Pelefonica din Romania, supported by subscriptions costing 600 lei ($3.60). A special permit by the Home Office is required of foreigners. Regenerative sets are prohibited.

A broadcasting station was opened in Bucharest on September 15, 1929. Satisfactory reception from Austrian, Czechoslovak, and Hungarian stations is possible.

Estimates give the number of receiving-set installations at 25,000. German sets predominate, with a limited number of French, British, and American. The American product is preferred in the higher-priced field. Alternating-current sets are proving most popular in the cities. Sales of battery and crystal sets are also increasing. Characteristics of lighting service vary widely. Short-wave reception is little known except among amateurs.

SOVIET RUSSIA

Language, Russian; area, 8,144,228 square miles; population, 147,013,600

The extent of Soviet Russia's radio development is little known. The climate is excellent for reception, but the purchasing power of the people generally is so low that there is little response to the many gestures of the government designed to encourage the use of receiving sets. It is apparent that a large proportion of those in use are the property of local organizations and municipalities, operating loud speakers in public places.

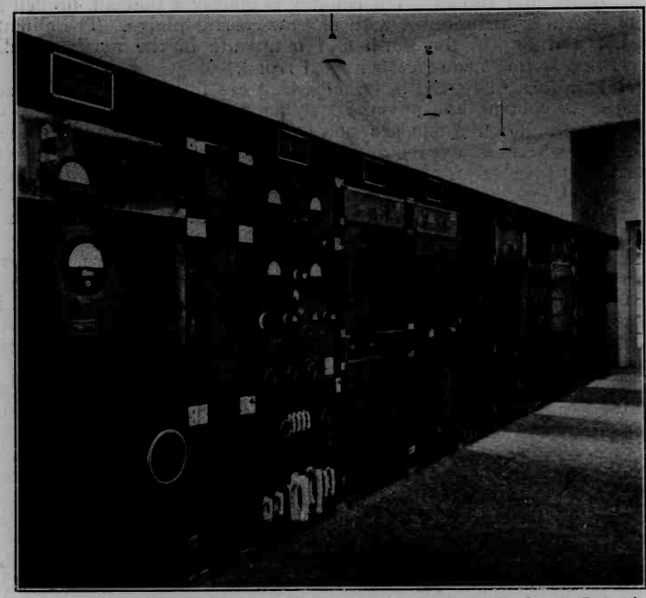

FIGURE 8.—A British control board of a broadcasting station at Bucharest, Rumania

Practically all of Russia has warm summers and cold winters. The northern coast has cool summers, while a large part of the southern territory has hot summers.

A news release emanating from the National Bureau of Information states that 500,000 receiving sets are in use. Claim is made that these are nearly all of Russian manufacture. There are 45 broadcasting stations listed in the files of the electrical equipment division of the United States Bureau of Foreign and Domestic Commerce. These are scattered throughout Russia and Asiatic Russia. In various sections European, Chinese, and Japanese stations are received.

SPAIN

Language, Spanish; area, 190,050 square miles; population, 21,763,147

Spanish radio developments have been moderately fast, with the government interested in furthering the use of radio. The climate is good, though not exceptionally so; distant stations are rarely heard, but local service suffers little. There is a great interest on the part of the people, but the purchasing power is largely concentrated in the cities. The well-scattered stations of the broadcasting set-up provide service throughout the country. The principal cities are Madrid, Barcelona, Valencia, Seville, Malaga, Mercia, Saragossa, Cartagena, and Bilbao. The country is mainly a plateau, broken in some parts by mountains, with narrow coastal plains. The climate is hot and dry in the south and temperate in the north. Radio reception is fair from October until April.

Regulations in regard to broadcasting are liberal. Programs are subject to control, and advertising must not exceed five minutes of each hour. Regulations are not rigidly enforced in any respect. Receiving licenses are required and foreigners must obtain special permits. Licenses for sets in homes cost 5 pesetas and in public places 50 pesetas. There are no restrictions on importing, merchandising, and manufacturing, except a requirement that salesmen be licensed.

Spain has 10 scattered broadcasting stations, giving satisfactory service. A plan for a broadcasting system of 19 stations, with a 40,000 watt short-wave key station has been determined upon and is expected to be put into execution during 1930. Programs from French, Italian, Portuguese, and other European stations are received, but the Spanish broadcasts appear to be the most popular.

An estimate recently made gives the number of receivers as 500,000 though only about 90,000 are registered, about 85 per cent of which are cheap tube sets or crystals. About 45 per cent of the high-grade sets sold are American, with an equivalent proportion from Germany. The latter country also supplies some 80 per cent of the low-priced sets. Alternating-current receivers are now demanded by purchasers. Lighting currents are at considerable variation but are mainly 110 or 220 volts, 50 or 60 cycles. There is considerable direct current, and good sets for this power should be introduced successfully. Reports indicate that the majority of the direct-current sets now used are not satisfactory. Short-wave reception is popular.

SWEDEN

Language, Swedish; area, 173,157 square miles; population, 6,087,923

It has been said that the greatest interest in radio has been taken in Sweden. The statistics bear out this statement, no other country except the United States showing a greater per capita development, while a consideration of the average purchasing power in each country serves to place Sweden in advance of the United States under this consideration. The Government has been especially active in the promotion of broadcasting and reception, as a result of which an excellent broadcasting system has been built up throughout the country. Sweden has perhaps the best climate for radio reception in the world. The principal cities are Stockholm, Goteborg, Malmo,

Norrkoping, and Halsingborg. The country has forested highlands in the north, lowlands and lakes in the central parts, and agricultural plains in the south. The climate is mild, owing to the Gulf Stream. The mean February temperature is 25° F., and the August mean is 62° F., at Stockholm. The air in that vicinity is damp, and fogs are frequent; the mean annual rainfall ranges from 18 to 20 inches. Radio reception is good throughout the year, especially from September to May.

Radio is under the control of the Telegraph Administration. A broadcasting monopoly has been granted to a corporation known as "Radiojans," but transmitting licenses are freely issued to amateurs.

FIGURE 9.—Swedish transmitter in a station at Stockholm

and the monopoly has provided facilities for the rebroadcasting of the programs of its stations by amateurs and radio clubs. Sweden now has 32 broadcasting stations scattered through the country, one operating on short waves. Broadcasts from neighboring countries are received readily but are not so popular as the Swedish programs.

Permits to install receiving sets are issued at the rate of 40 crowns ($10.72), while receiving licenses cost 10 crowns ($2.68) per year. Manufacturing, importing, and merchandising are not subject to any exceptional restrictions.

Licenses have been issued for 427,564 receiving sets, with an additional number, not estimated, operated unlawfully. Swedish manufacturers supply a large part of the market, with large numbers of

German and Dutch sets in use. The use of alternating-current receivers in Sweden is advancing rapidly, there being but little demand for battery sets. Lighting service in most sections is at 127 or 220 volts. Short-wave sets and adapters are used to a limited extent.

SWITZERLAND

Language, French, German, and Italian; area, 15,976 square miles; population, 3,987,000

The topography of Switzerland is such as to render radio broadcasting and reception difficult on ordinary types of inexpensive apparatus. The climate, however, is very good, somewhat reducing the deleterious effect of the topography. The people generally appear to be interested, and the Government has aided considerably by permitting freely the establishment of broadcasting stations and installation of receiving sets, so long as the service itself did not suffer thereby.

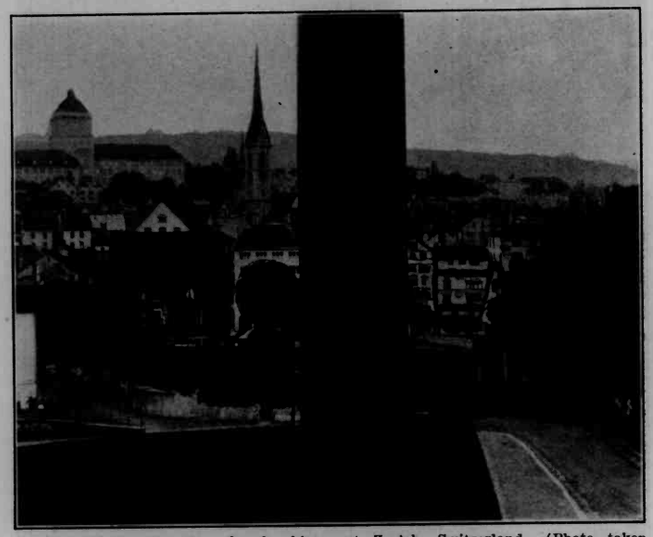

FIGURE 10.—Broadcasting church chimes at Zurich, Switzerland. (Photo taken from belfry)

The principal cities are Zurich, Geneva, Basel, Lausanne, Berne, and St. Gall. Owing to its mountainous character, Switzerland has a wide variety of climate. Radio reception is good in all altitudes from September to May and in the lower portions throughout the year.

Radio is under the control of the Federal Department of Posts and Railways. Broadcasting concessions are granted for each station, but a nationalized system is under consideration. Permits to operate receiving sets are granted to Swiss citizens only. A preliminary Government inspection of the installation, costing 3 francs ($0.60) is required, the annual assessment being 15 francs ($3), of which the Government retains 20 per cent and the remainder is paid to the broadcasters. No special restrictions are imposed on manufacturers, importers, and merchants.

Licenses have been issued for 77,959 sets, mostly of Swiss and German origin. The trading is so highly competitive that dealers are reluctant to handle American sets unless stocks and repair parts are obtainable in some European free port. The frequent appearance of new models prevents the dealers from profitably carrying more than minimum stocks.

A large portion of the sets in use are crystal type, but their sale has fallen off greatly during the past year. Broadcasting societies are organized under Federal registrations, to operate the stations. Advertising is specifically forbidden. Six broadcasting stations are operating in Switzerland; stations in France, Germany, Austria, and other neighboring countries are also received. Two of the Swiss stations broadcast on short waves. Alternating-current receivers have attained great popularity. Either 110 or 220 volts, alternating current, is available in every city. Short-wave receivers are generally known but little in demand or use.

TURKEY

Language, Turkish, English, and French; area, 282,627 square miles; population, 13,640,810

Turkey's radio development is now in only the primary state and can not yet be said to indicate the country's capacity.

The principal cities of Turkey are Istanbul, with a population of 1,000,000 (the only city having over 60,000), Smyrna, Angora, and Adrianople. The surface of the country is undulating and largely mountainous, with a moderate climate. The mean January temperature at Istanbul is 43° F., and July, 73° F. Rainfall is abundant on the coasts, but the interior is dry. The summers are short and hot and the winters long and cold. Radio reception is best from October to April.

Radio is under the control of the Administration of Posts, Telegraphs, and Telephones. Broadcasting and the sales distribution and installation of receiving sets is a monopoly granted to the Societe Anonyme Turque de Telephonie Sans Fil. Before purchasing receivers, prospective listeners must obtain permits from the company, which also serves as a license for one year, costing 10 Turkish pounds ($44). Renewals are at the same rate. Sets must be available for Government inspection at all times and are subject to confiscation without warning, explanation, or indemnity.

About 5,200 receivers are in service, some 50 per cent being German and 25 per cent French. Turkey has two broadcasting stations, at Osmanie, near Istanbul, and at Angora. The former was shut down in January, 1930, because of financial difficulties, but resumption of service is expected. Some of the higher-powered European stations are received, but there are no other near-by broadcasting stations.

Socket-power sets have attained considerable popularity. Short-wave reception has a limited clientele, but is particularly interesting to that class. Electric service in Istanbul is 50-cycle alternating, some 110 and some 220 volts.

UNITED KINGDOM

Language, English; area, 94,284 square miles; population, 44,173,704

The United Kingdom is one of the countries showing the greatest degree of radio development in the world. Its home development has amply justified the early recognition of the value of Marconi's invention, which it granted after other countries had passed it by. In the field of broadcasting and in all wireless activities the people are highly interested much more in the service than in the means of providing that service—a condition which indicates a solid basis for further advancement. The climate is excellent for radio reception, and the broadcasting system, designed for proper service in all parts of the Kingdom, has proved the most satisfactory of any monopoly system yet adopted.

Radio is controlled by a monopoly vested in the British Broadcasting Corporation, a division of the Post Office Department. Its activities are supported by the proceeds from license fees.

There are 20 broadcasting stations in the United Kingdom, one of which, at Hull, operates only on special occasions, another being a short-wave station. The two stations in the Irish Free State and several on the Continent are also received. A revision of the broadcasting system is in progress. When completed, five regional stations will serve the whole island of Great Britain, each broadcasting two programs on separate wave lengths. One program will be a "chain" broadcast from all five stations, while the other will be local. The first of these regional stations has been completed at Brookman's Park, about 17 miles from London, but the majority of London listeners complain that because of the high power, twin programs interfere not only with each other, but "blanket" all outside reception. This result is claimed to be the fault of receivers and not of the twin-wave system, and work on the other four stations is therefore proceeding with no modification of the plans. Listeners are advised to purchase wave traps to remedy the situation so far as mutual interference is concerned, or "twin-wave traps" if outside stations are desired. Portable sets, formerly very popular in England, may be entirely eliminated from use by the prevailing conditions.

Receiving licenses are issued to all applicants and cost 10 shillings ($2.43) a year. There are no other restrictions on the ownership and operation of sets, nor on importing, manufacturing, or merchandising. The British manufacturing industry, however, has attempted to limit the sale of imported products by granting additional discounts to those dealers who do not handle any imported radio apparatus. This method was tried for over a year and proved so unpopular with most dealers that they refuse to renew agreements. They found the additional discounts insufficient to repay them for the business lost through their failure to handle imported apparatus.

The number of licensed sets in service total 2,515,608. Nearly all of the needs of the British market are supplied by some 2,000 domestic manufacturers, but German and American sets are used in large numbers, with some of French, Italian, Swedish, or other manufacture.

Alternating-current receivers, known as mains sets (equivalent to "socket-power"), are attaining popularity. Lighting service is almost universally 220-volt, 50-cycle alternating current, and under plans now approaching completion, so far as the more important districts are concerned, will be uniformly so. Short-wave reception is very popular.

YUGOSLAVIA

Language, Slavic tongues and German; area, 96,134 square miles; population, 12,017,323

Radio developments in Yugoslavia have been slow, with few conditions especially encouraging. The people have a low purchasing power and are not generally interested in such advantages as are provided by radio.

The country for the most part is mountainous and the climate temperate, rather similar to our Middle Atlantic States. Reception is good from September to May.

Permits are required for broadcasting stations. Nothing except music may be broadcast. Private persons may not install broadcasting stations or other sending sets. The permission of the Ministry of Posts and Telegraphs is required before a receiving set may be installed. A license fee of 25 dinars (33 cents) per month is charged, 60 per cent of the proceeds being paid over to the broadcasters. Theoretically, foreigners may not obtain this permission, although exceptions are made. In applying for a permit to install a receiving set, the individual must describe his set in detail and indicate the room in which it may be found. Permits may be revoked at any time.

Yugoslavia has some 40,000 receivers in use, nearly all of German or Dutch origin. American sets are known, and those in use give great satisfaction, though the prices are too high for the general market. These sets are all constructed for the long waves used in Europe. There are three broadcasting stations in the country, but good reception from neighboring countries is reported. Some alternating-current sets are in use and are proving satisfactory. Short-wave reception is not common.

ASIA

ADEN

Language, Arabic; area, 9,080 square miles; population, 54,923

The British Protectorate of Aden has had practically no radio development. It is hot at all seasons, and radio reception is difficult, particularly over the distance now necessary. Aden has no broadcasting, but is dependent upon occasional reception from distant stations, none of which can be picked up for satisfactory reception. Only five receivers have been installed. These are in the possession of Americans and Europeans who took them among household effects when going to Aden. Two British short-wave sets have been put into service and have proved highly satisfactory. European and American short-wave stations are received at certain hours, as is the station at Nairobi, Kenya, when operating. The time difference between Nairobi and Aden is 29½ minutes.

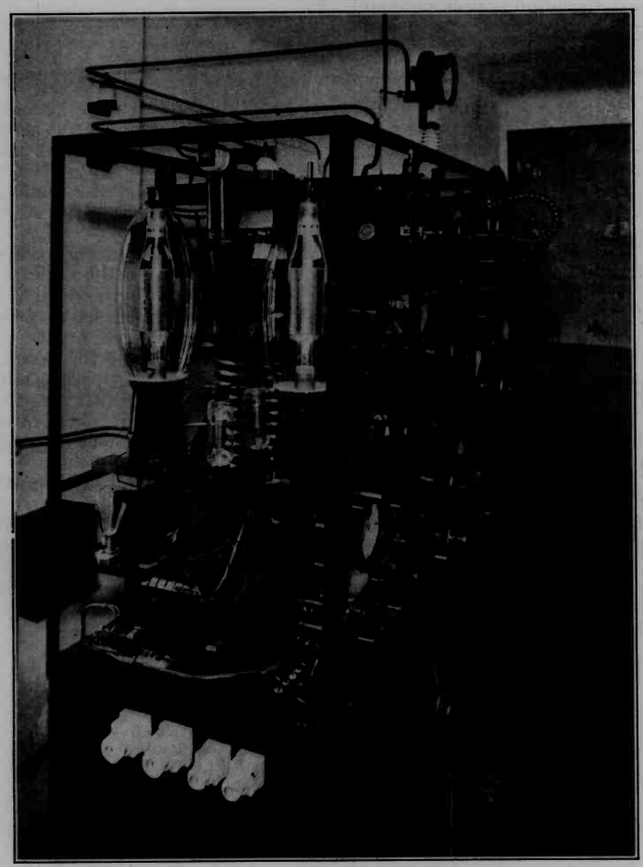

FIGURE 11.—A transmitter at Zagreb, Yugoslavia

ARABIA

Language, Arabic; area, 1,200,000 square miles; population, 7,000,000

Arabia has no great radio development, owing principally to the poor climate and the absence of broadcasting. Twelve sets are reported in use, all the property of Europeans and Americans stationed temporarily in Arabia. Summers are hot and winters warm, graduating to cool in the northwestern part. Reception is difficult at all seasons, but the distance from broadcasting is mainly responsible. The nearest broadcasting stations are those at Bombay, Osmanie, and Cairo, none coming in with satisfactory clearness or volume. Short-wave reception from Nairobi, Kenya, should be satisfactory, though so far as is known no short-wave sets have been tried in Arabia except those in Aden.

CEYLON

Language, English; area, 25,332 square miles; population, 5,009,502

Considering the adverse climate and the limited number of people able to afford the investment necessary to obtain radio service, Ceylon has advanced radio development. The Government encourages its use and operates the only broadcasting station on the island. The people able to afford sets are generally interested, finding that it serves the particular needs very satisfactorily. The principal city is Colombo. The climate is hot and damp, and generally poor for radio. The regulations governing radio are similar to those of India, although Ceylon is a separate colony of the British Empire. Some 1,500 receiving installations have been made. American sets are not used to any extent. The station at Colombo and those in India are received regularly. Short-wave reception has a certain limited field. Alternating-current sets are required for Colombo, but battery sets are needed in all other places.

CHINA

Language, Chinese; area, 4,227,170 square miles; population, 400,800,000

Radio developments in China have been seriously retarded by the Government's attitude, which has recently been abandoned in favor of a policy of encouragement and assistance. The Chinese themselves show little interest, but popularity among certain classes is growing perceptibly. The foreigners of nearly all classes are finding radio popular and are installing receiving sets.

Shanghai, Hankow, and Peking have populations in excess of 1,000,000 each. The country's surface consists mainly of plains along the coast, with mountainous regions in several sections. The climate is generally hot and the humidity high. Reception is generally poor.

China now has 14 broadcasting stations, while service is also obtained from Japan, Chosen, Kwantung, and Siberia.

Radio regulations do not impose any exceptional restrictions on broadcasters or owners of receiving sets. Importers, however, are required to submit complete and highly detailed information regarding each shipment of radio equipment to local authorities. The Ministry of Military Administration determines whether an import

permit will be issued. On subsequent applications, the final disposition of the preceding shipment must also be stated. A fee of $10 and a $2 stamp must be paid with the application.

The more recent estimates indicate that about 10,000 receivers have been installed. These originated in various countries, principally the United States, Japan, England, France, and Germany. The construction committee of the nationalist Government opened a radio factory at Shanghai with 40 workers in February, 1930. Alternating-current sets are in use only in exceptional cases. Short-wave receivers are not popular.

CHOSEN

Language, Japanese; area, 84,738 square miles; population, 19,519,927

The development of radio in Chosen has been much greater than would be expected from a review of the conditions obtaining in the country. Although wealth is highly concentrated, there are numerous families able to afford the purchase of receivers, and a large proportion of these have installed them.

The principal city is Keijofu (Seoul), which has a population of 250,000. The climate is generally moderate, but the summers are hot and rainy. The mean annual rainfall is 36 inches, most of which falls in July. Reception is good from September to May.

Radio in Chosen is administered through the Japanese Government Bureau of Communications, since this is a Japanese possession. Japanese regulations are in force, limiting receiving sets to non-regenerative types not capable of receiving on wave lengths of over 400 meters.

There is one broadcasting station at Seoul; in addition, stations in Japan, Kwantung, China, and Siberia are received.

An estimate giving the number of receivers as 12,000 has been reported. American and Japanese receivers are the most popular. Neither alternating current nor short-wave sets are in use.

FRENCH INDIA

Language, French; area, 196 square miles; population, 273,081

Most of the radio development in French India may be traced to the developments in British India. The markets in these areas are generally among the French population. About 50 sets are in use, all French. French India has no broadcasting, reception being from stations in British India and Ceylon only. All seasons are hot and radio reception poor.

FRENCH INDO-CHINA

Language, French; area, 265,004 square miles; population, 19,844,181

Radio developments in French Indo-China have been very slow, and there is little promise of early development. The climate is poor for radio reception. The use of receiving sets is prohibited, but a few sets are in use by Government officials entitled to exception from the prohibition. Practically all of the population is Asiatic and not especially interested in modern innovations. The latest estimate is that about 25 sets are in service, but it is believed

that the actual number is much greater. Nearly all are of French manufacture. A short-wave broadcasting station is understood to be operating in Haiphong. Reception from Singapore, Manila, and other cities is unsatisfactory.

HONG KONG

Language, English; area, 391 square miles; population, 662,950

Hong Kong has had little development of radio, and broadcasting stations previously operating there were abandoned for lack of reason for continued operation. There has recently been constructed a new station, however, and it is believed that a greater development will take place.

Americans and Europeans number about 10,000. The principal city is Victoria. The island is a rugged ridge of granite, broken by narrow valleys. Hong Kong is in the typhoon belt and has a rainy season from March to May. From November to March it is comparatively cool, at which time radio reception is fair.

Hong Kong has had a broadcasting station at Victoria since April, 1927. This station formerly sent out only storm warnings and other meteorological data, but in the fall of 1928 was reconstructed and its activities reorganized on a general broadcasting basis.

Receiving license is required, costing 5 Hong Kong dollars per year ($2.20 in United States currency). Receivers licensed number 700, with a number of unlicensed sets also in use. Sets are principally British, though some are American. Socket-power receivers have not proven to be completely satisfactory. Short-wave sets are in the great majority.

INDIA

Language, English; area, 1,805,332 square miles; population, 318,885,980

British India has had considerable difficulty in building up a great radio public. The present unsettled political situation can not be held to be solely responsible for the general lack of interest in radio, as the Indian Broadcasting Co. has never been able to operate at a profit. The company became insolvent in late 1929, since when the Bombay and Calcutta stations have been continued by the Government. In April, 1930, the Government of Mysore State determined upon constructing a station at Bangalore, adding to the Indian service. The Madras city government is said to be considering the establishment of a municipal station. The principal cities are Calcutta, Bombay, Madras, Hyderabad, Rangoon, and Delhi. The great central part of India is a plateau, surrounded by low strips along the coasts and by plains in the north, which are bordered by the Himalaya Mountains. Humidity and temperature are high except during the period from November to January. Radio reception is good from November to May in most sections.

Radio is under the control of the Director General of Posts and Telegraphs. Receiving licenses are issued to all applicants. These cost 10 rupees ($3.65 per year), of which the broadcasting company receives 8. Import permits are required.

The total number of receivers is about 3,600. These are largely American. It is the general belief that American sets are not properly insulated for the Indian climate. A few alternating-current sets are in use and appear to have given satisfactory results, but battery sets are still in demand, as much of India is as yet without electric service. Short-wave sets are popular in the interior and among a certain class of listeners in the population centers.

IRAQ

Language, Arabic; area, 143,240 square miles; population, 3,000,000

There has been practically no development of radio in Iraq, owing to the adverse climate and the distance from broadcasting. The weather is hot at all seasons and radio reception correspondingly poor.

Iraq has no broadcasting, but infrequent reception from European stations is possible. Receiving licenses issued number 31, but of this number 7 sets have been dismantled. The slump is due to the migration to America of the only dealer in Iraq who had any technical radio knowledge.

JAPAN

Language, Japanese; area, 148,756 square miles; population, 59,138,000

Japan is the leading country of Asia in radio development. Before any developments were permitted, the Government made a thorough study of broadcasting and its uses, so that the earliest developments were based on a carefully thought-out plan. This has never been changed in its essentials, and under it progress has been rapid. The climate is good, and the people are interested to a great extent. While wealth is somewhat concentrated, this condition is not as serious as in some other countries, and a large proportion of the population is able to purchase receivers. The principal cities are Tokyo, Kobe, Osaka, Kyoto, and Nagoya. The surface of the country is generally mountainous, being of volcanic origin. The climate is good for radio, although warm and damp. Reception is fair throughout the year and good from September to May.

Radio broadcasting is controlled by the Bureau of Communications, broadcasting permits being issued only to Japanese citizens. Each station licensed has a partial monopoly within certain bounds. Stations are divided into two groups according to their power. Low-powered stations have monopolies in certain small areas, while high-powered stations have monopolies in a large area, which may include several of the areas assigned to local stations. In theory, this would restrict the number of stations which might be received at any point to one high and one low powered station, if all of the stations provided for were operating.

Broadcasting is supported from license fees. Receiving sets may be operated upon payment of the license fee of 1 yen per annum to the Government and a subscription fee of 1 yen per month to the broadcasters. Permits to install are required, and only sets approved by the Bureau of Communications may be used. Manufacturers and importers may deposit a sample set, the approval of which will serve for all additional sets of the same type so long as none of

the specifications is changed. Wave lengths of from 150 to 400 meters only may be used.

Japan has 10 broadcasters, including two short-wave Siberian and Chinese stations. Dairen and Seoul stations are also received.

The number of receiving sets is estimated at about 641,774. Japanese manufacturers have supplied a large number of these. Formerly they imported parts, but these, too, are of local manufacture at present. The import market now is for material for the manufacture of parts. Alternating-current receivers have superseded

FIGURE 12.—A Japanese trio of instruments—koto, shakuhachi (flute), and samisen—broadcasting in a studio at Osaka, Japan

battery types, about 50 per cent of the tube sets in use now being of the first kind. Short-wave reception has aroused considerable interest.

KWANTUNG

Language, Japanese; area, 1,305 square miles; population, 1,056,076

There has been a fair degree of radio progress in Kwantung, even though there is but a small portion of the population with sufficient wealth to purchase receivers. Kwantung has hot summers and cold winters, with fair summer and good winter reception.

Sets in use number 3,910, being Japanese, American, and British in origin. One broadcasting station at Dairen is operating. Chinese, Japanese, Siberian, and Korean stations are also received. So far as is known no alternating-current or short-wave sets are in use.

MACAO

Language, Portuguese; area, 4 square miles; population, 74,668

Little radio development has been noted in Macao, although the number of listeners appears to be growing. Summers are hot and winters warm, with comparatively poor reception throughout the year.

About 40 sets are now installed, purchased in all parts of the world. There is no broadcasting, but reception from Hong Kong and, to a lesser extent, from Chinese and Japanese stations, is satisfactory. No alternating-current sets are in use. One or two short-wave receivers are giving little service.

NETHERLAND EAST INDIES

Language, Dutch; area, 733,642 square miles; population, 49,534,618

Radio in the Netherland East Indies is not greatly advanced, owing to the late introduction of satisfactory apparatus. The climate is hot and damp, but there is some radio reception of a satisfactory character. There are no exceptional restrictions on the use of radio. Ten broadcasting stations, all operating on short waves, are scattered through the islands. Their services are supplanted by reception from southern continental Asia and the Philippine Islands. A broadcasting monopoly is favored, though it has not yet been put into effect. Developments have been entirely in short waves for local as well as long-distance reception. The short-wave broadcasts from the Netherlands are the programs most appreciated.

Only 106 receivers have been installed. These were largely purchased in the Netherlands and represent various European makes. American sets have not generally proved to be properly constructed for the climatic conditions of the East Indies. Socket-power sets are not popular, since current characteristics, where electricity is available, vary greatly.

PALESTINE

Language, Arabic and French; area, 900 square miles; population, 852,268

Several attempts to popularize radio in Palestine have been made, and each has proved successful to a certain extent. On the whole, developments have not warranted the efforts made. The conditions existing are not such as to bring about any great development until broadcasting stations have been established nearer than at present. Summers are hot and winters warm. Reception is poor most of the year and never particularly good.

Palestine has no broadcasting, but Cairo, Osmanie, and the larger European stations are received. Estimates place the number of receiving sets installed at 150. These are largely French with some American, British, and German. No alternating-current or short-wave receivers are known.

PERSIA

Language, Arabic; area, 628,000 square miles; population, 10,000,000

The climate and the purchasing power of the people have prevented any development of radio in Persia. The summers are hot and winters cool; reception is never exceptionally good, being almost impossible during the summer. About 300 sets of various origins are in use, owned by foreigners. Persia has no broadcasting, but is dependent upon stations at Bombay, Osmanie, and in Russia, all more than 1,000 miles distant. No alternating-current or short-wave sets have been reported.

SIAM

Language, Siamese; area, 200,148 square miles; population, 9,831,000

Radio has had no development in Siam. Two-thirds of the population are Siamese. The principal city is Bangkok, which has a population of about 750,000. The northern portion of the country is mountainous, the central part is a plateau, and the southern part is covered by plains. There are also numerous islands off the coast. The general climate is fair for radio, except in the mountains and some other sections.

Broadcasting is prohibited for the avowed purpose of preventing the marketing of unsuitable receiving equipment until experiments determine the most effective types of sets for local use. Receiving is nominally allowed under special permits; these permits, however, are not issued. The sets owned represent the property of the governing class and number 25. The origins of these are various. Reception from China, India, and Singapore is not entirely satisfactory. No alternating-current or short-wave sets are in use.

STRAITS SETTLEMENTS

Language, English and native dialects; area, 1,600 square miles; population, 937,099

Radio is popular to a certain extent in the Straits Settlements, but since the popularity is restricted to the whites, only a limited stage of advancement has been noted. The climate is poor for radio, being hot and damp. Half the population is concentrated in Singapore. There are but 20,000 Europeans. A broadcasting station was installed in Singapore in November, 1926, but was closed in 1927. At the present time it is understood that short-wave stations in Singapore and Johore are giving broadcast service. Stations in India, the Philippines, and the Netherland East Indies are received. Receiving licenses are required. About 500 sets are in use, mostly British. So far as is known alternating-current sets are in use. Only short-wave sets can be sold, since satisfactory long wave reception is impossible.

SYRIA

Language, Arabic; area, 60,000 square miles; population, 2,981,863

Radio has not yet been introduced successfully in Syria. The weather is hot in summer and cool in winter, and reception is generally poor.

Some 150 sets have been installed by owners who purchased them prior to going to Syria. Receiving permits are granted freely, costing 5 Syrian gold piasters ($0.96). There is no annual charge. There is no broadcasting, reception from Russia and from Osmanie, Turkey, being depended upon.

OCEANIA

AUSTRALIA

Language, English; area, 2,974,581 square miles; population, 5,495,734

Australia is one of the leading countries of the world in the matter of radio development. Progress there has been exceptionally

steady and has attained a high point. The people are deeply interested, and the Government has gone to great lengths in encouraging the use of broadcasts to communicate entertainment and news throughout the Commonwealth. Of the total population 43 per cent are resident of the six capital cities. The principal cities are Sydney, Melbourne, Adelaide, and Brisbane.

Radio developments have been confined to the south coast and the southern part of the eastern and western coasts, these being the more thickly populated areas. The climate of this section is good for radio reception, the best season being from April to September.

Broadcasting is under the control of the Postmaster General. Stations are divided into two categories, those of high and those of low power. There is no restriction as to the number or location of low-powered stations, but high power is permitted to only one station in each of the States, except Victoria, and New South Wales, each of which may have two. These stations are more strictly administered than those of low power and participate in the proceeds from receiving license fees. Arrangements have been made for these stations to be taken over by the Federal Government.

Australia has 19 broadcasting stations. Three of these use double waves, one short and one middle. The Australians take great interest in short-wave broadcasts from American stations. New Zealand is commonly received in eastern Australia.

An annual receiving license, costing 17s. 6d. or 24s., depending on the distance of the receiver from the principal stations, is required. The licensed receivers numbered 309,820 in December, 1928, while varying estimates agree that the number of illegally operated receivers is large. American sets were formerly most popular and in the majority. In 1927 the domestic radio-manufacturing industry became established and by November, 1929, had grown to such proportions that a high tariff was applied to radio products. Early in 1930 a general increase and restriction on imports was applied. Until more data as to the effects of this latter legislation can be obtained, it appears that the Australian market is practically closed to American radio products. British sets are numerous, and a few German receivers are in use.

BRITISH OCEANIA

Language, English; area, 28,365 square miles; population, 480,357

British Oceania, consisting of scattered islands and groups throughout the South Pacific, shows a combined radio development of no mean proportions. Radio has proved particularly popular among the whites stationed in more or less isolated islands for government or trading purposes. Hot weather is usual in all parts of British Oceania at all seasons.

It is estimated that some 250 receivers are in use. Nearly all are of British origin. A new short-wave telephone transmitting station at Suva in the Fiji Islands has been broadcasting music, speeches, and church services on occasion for several months. Regular broadcasting from Australia, New Zealand, Hawaii, and elsewhere is received. Short-wave sets are the most popular.

FRENCH OCEANIA

Language, French; area, 1,520 square miles; population, 31,655

French Oceania has had little radio development. Nearly all of the present demand is for short-wave receivers by European residents.

All seasons are hot, with poor reception. About 30 sets are in use. French makes only are represented. No French broadcasting is available, but Hawaiian, Australian, and New Zealand stations, all broadcasting in the English language, are received.

NEW ZEALAND

Language, English; area, 103,862 square miles; population, 1,407,165

New Zealand has a rapidly increasing development of radio broadcasting and reception, but the conditions have been such that the rate of progress is not an accurate indication of the basic development of the country. Soon after broadcasting was introduced in the world, New Zealand had a number of broadcasting and receiving sets. But difficulties arose through patent rights, and for more than a year there was no broadcasting in the islands. Subsequent resumption of broadcasting stimulated developments in the receiving field, and there has since been a steady increase in the number of receivers in use.

The principal cities are Auckland, Wellington, Christchurch, and Dunedin. The eastern slopes of the two main islands are plains, the western portions being volcanic mountains. The climate is mild, but rainfall is abundant. Radio reception is good, especially during the winter months from April to September. Broadcasting is closely supervised by the Government. Receiving licenses are required, costing 30s. per year. Regenerative sets are prohibited.

Twenty broadcasting stations are operating in the principal cities, one in Christchurch using a double wave to give short-wave service. Australian broadcasts are also received.

Some 45,928 receivers are under license in New Zealand. Approximately 60 per cent are of American manufacture, the remainder principally British. About 90 per cent of the tubes sold are American. Socket-power sets suitable for use with 230-volt, 50-cycle current are in demand. Short-wave sets are also popular, though their use is more restricted, amounting to some 10 per cent of the total.

AFRICA

ALGERIA

Language, French and Arabic; area, 222,180 square miles; population, 5,992,770

The development of radio in Algeria has been restricted mainly to the French residents, among whom there has been an appreciable increase in its use. Radio provides contact with France which otherwise is impossible. The native population is not interested. Hot summers and cool winters are the rule. Static is bad, especially during the summer. The total number of sets is estimated at 9,500. French products predominate. Alternating-current receivers have met with little success. Short waves have a certain popularity as

a means of better reception from France. A broadcasting station is operating in Algiers.

ANGOLA

Language, Portuguese; area, 484,800 square miles; population, 2,481,956

Angola has not seen any great development in radio. The class to be interested are the Portuguese, and there is no Portuguese broadcasting nearer than Portugal or Brazil. Summers are hot and winters warm. Reception is poor. The only stations which may be received regularly are those in the Union of South Africa. About 50 receiving installations have been made, mostly representing British and American makes. There are no alternating-current or short-wave sets, so far as can be ascertained.

BASUTOLAND

Language, native dialects; area, 11,716 square miles; population, 515,781

Radio developments have been limited in the native State of Basutoland. Summers are warm and winters cool, with corresponding receiving conditions. The only broadcasting received is that from stations in the Union of South Africa. Not over 10 sets are in use. These are understood to be of British manufacture. Alternating-current receivers have not yet been introduced. One or two of the receivers in use have been equipped for short-wave reception.

BECHUANALAND

Languages, English and native dialects; area, 275,000 square miles; population, 154,983

There are only a few whites in Bechuanaland, and the number of receiving sets is accordingly restricted. Estimates indicate only 15 installed, mostly British. The stations of the Union of South Africa are received regularly.

BELGIAN CONGO

Language, French; area, 909,654 square miles; population, 8,500,000

Developments in radio in Belgian Congo are limited to the high-powered sets maintained on the coast for reception of European broadcasts. All seasons are hot, and reception is correspondingly poor. There is no near-by broadcasting. But six sets are in service, all probably of Belgian origin. Short-wave receivers should be satisfactory for use in the Congo, but no information as to their use is available.

BRITISH SOMALILAND

Language, Arabic; area, 68,000 square miles; population, 347,000

There is practically no development of radio in British Somaliland. The entire year is hot, and static is bad. Only five installations have been made, all of British sets. The only near-by broadcasting station is that at Nariobi, Kenya.

BRITISH WEST AFRICA

Language, Arabic; area, 493,628 square miles; population, 22,681,696

The scattered colonies of British West Africa show little progress in the development of radio. All of British West Africa lies within

the zone where all seasons are hot, and static conditions are correspondingly bad. No broadcasting stations are operating in West Africa, the more powerful European stations being depended upon for what reception is possible. Altogether, some 50 sets are reported in use, and it is believed that only British makes are represented. No alternating-current sets are in use anywhere in British West Africa. Short-wave receivers are popular and are used at many points to keep in touch with the United Kingdom.

CANARY ISLANDS

Language, Spanish; area, 2,807 square miles; population, 481,555

The people of the Canary Islands have shown a great interest in radio, but developments have been limited by the low purchasing power of the people and the lack of sufficiently powerful broadcasting stations to serve the entire group.

This group of islands is of volcanic origin and includes seven large inhabited islands and many islets. Radio reception is good from November to April.

Radio is controlled through the Director General of Communications. Broadcasting is permitted to Spanish citizens, and licenses are issued on the payment of a fee. Receiving installations require permits costing 5 to 50 pesetas, according to the use to which the set is to be put. A special type of permit is provided for foreigners.

One broadcasting station is operating, while conditions are occasionally favorable for receiving from Spain.

The number of receivers installed is estimated at 200. A large part of these are of American manufacture. Various European makes are also represented. Alternating-current sets have not been put into use. Interest is now centered on short waves, because of atmospheric conditions and more varied reception.

EGYPT

Language, Arabic; area, 347,840 square miles; population, 14,168,756

Radio has been limited in Egypt by the Government's failure to provide regulations for broadcasting, but it has proved very popular. European broadcasting is regularly received and has brought about a high rate of development. It is expected that the establishment of an officially recognized broadcasting station or system would greatly improve the situation.

The populated section of the country is the Nile Valley, especially the delta region. The climate is fair for radio, and reception is good from November to May.

There are two broadcasting stations in Cairo. The identity of the broadcaster is known to the public, but officials are careful to avoid "learning officially" of them since any cognizance would probably necessitate closing the stations. European broadcasts, particularly from Osmanie, are received.

About 4,000 receivers are in service. British sets are the most popular, French and American also being used extensively. A small number of alternating-current receivers has been put into use. Short-wave reception has been popular.

ETHIOPIA

Language, Amharic; area, 350,000 square miles; population, 10,000,000

Ethiopia has the smallest degree of radio development of any country in the world. Only two receiving sets have been reported in this country, but that this number was increased by the importation of several gift sets at the time of the Emperor's coronation in November, 1930, is well known. Members of the royal family, the priesthood, and foreign legations may be considered as the principal buyers of receivers. Summers are hot, winters are warm, and reception is poor throughout the year. The nearest broadcasting is at Nairobi, Kenya. No regulations have been adopted.

FRENCH EQUATORIAL AFRICA

Language, Arabic; area, 982,049 square miles; population, 2,845,936

French Equatorial Africa, aside from the coasts, is principally desert, and little of the area is involved in radio developments. In the vicinity of St. Louis, Senegal, there has been an appreciable amount of progress made.

Summers are hot; winters are warm in the north and hot in the south. Climatic conditions are poor throughout the year. There is little reception, the more powerful stations of Europe providing what service is available.

Some 500 receiving installations have been made. Most of these sets are French. Some short-wave sets have been put into service to receive from stations in northern Africa and France. Sets for this purpose might find a good demand.

FRENCH MOROCCO

Language, French; area, 213,000 square miles; population, 4,229,146

There is a considerable degree of radio development in French Morocco among the French and other Europeans there, but little interest has been aroused among the native Moroccans. It appears that the ability to keep in direct touch with Europe is the principal motive. Summers are hot and winters cool. Reception is good during winter but poor in the summer.

Three broadcasting stations are operating, while Algerian, French, and Spanish stations are also received. Two of the stations use short waves, one operating on a double wave. There are about 2,500 receivers in use, largely French. There are a few alternating-current sets in use, but the service is not satisfactory. The current at Casablanca is 110 volts, 50 cycles, but there is much variation in other localities. Short waves have proved valuable in the French-controlled areas of Africa, and short-wave sets are constantly becoming more numerous.

ITALIAN AFRICA

Language, Arabic; area, 879,435 square miles; population, 2,200,000

The scattered colonies of Italy in Africa have shown only limited interest in radio, there being little in their characteristics to encourage any great developments. The climate is generally poor for radio and the people interested few in number. The distance from

broadcasting further limits the field. There is no broadcasting in Italian Africa. Tripoli receives Italian stations and other European broadcasts. Estimates indicate that a total of about 250 sets are in use. Most of them are Italian and a number of British manufacture. Short-wave reception has a certain degree of popularity, since by this means programs from Rome can be picked up.

KENYA

Language, Arabic; area, 245,000 square miles; population, 2,575,789

Kenya has not exhibited especially great interest in radio, but with the establishment of a new broadcasting station at Nairobi greater developments are expected. The summers are hot and winters warm, with resultingly poor reception from distant stations. The number of sets in use is estimated at 250, nearly all British. As yet alternating-current sets have not been introduced. Short-wave reception is becoming popular more rapidly than reception in the broadcast wave band because stations in Johannesburg and England as well as the new local station may be received through the former medium.

LIBERIA

Language, English; area, 36,834 square miles; population, 1,500,000

There has been as yet no development of radio in Liberia; summers and winters are both hot, with poor reception resulting. Only five receivers have been installed, three of them being American. The broadcasting from European stations is depended upon for programs. Alternating-current receivers are not used.

MADAGASCAR

Language, French; area, 225,707 square miles; population, 3,598,728

Radio has not had any great development in Madagascar but is gaining in popularity. Several short-wave stations which may be used for broadcasting are now contemplated.

The principal cities are Antananarivo and Tamatave. In general the island is a plateau; there are several extinct volcanoes. The climate is tropical. From June to November it is cool and dry; during the remainder of the year rain is frequent and the temperature high.

The only broadcasting available for average sets is that from South African stations, although some of the more powerful receivers pick up European programs. French regulations are in force.

About 150 receiving sets are reported to be in use. These are French, brought from France chiefly by officials assigned to posts in Madagascar. No alternating-current sets are in use. Some experimentation with the use of short waves for picking up Eiffel Tower programs has been carried out with success.

MOZAMBIQUE

Language, Portuguese; area, 428,132 square miles; population, 3,160,500

The development of radiobroadcast reception in Mozambique has not been great. Only a small per cent of the population are

Europeans. The principal cities are Lourenco Marques and Beira. The country is mainly mountainous. The rainy season lasts from November to March. The coasts are hot, but the highlands are temperate. The Chief of Posts and Telegraphs has authority over all radiobroadcasting activities.

About 75 receivers have been installed, representing various European and American makes. The only broadcasting available is that from the Union of South Africa and Kenya, all of which is in English. Alternating-current receivers are as yet unknown. Short-wave reception is not particularly popular, inasmuch as there are no short-wave broadcasts in the Portuguese language.

NORTHERN RHODESIA

Language, English; area, 291,000 square miles; population, 1,154,624

The distance from broadcasting has hindered the development of radio in Northern Rhodesia. All seasons are hot, with poor reception conditions. There are only 25 sets in the colony, mostly British. Stations in Kenya and in the Union of South Africa are received. No alternating-current sets are used. Short-wave reception is arousing some interest since the commencement of short-wave broadcasts from Johannesburg and Nairobi.

SOUTHERN RHODESIA

Language, English; area, 148,575 square miles; population, 873,647

Southern Rhodesia has shown a great interest in radio, but the developments have been limited by the distance from broadcasting stations and the expense of the types of sets necessary. Summers are hot and winters warm, reception being poor.

Regulations provide for the payment of a license fee annually, amounting to £2 ($9.75) per year for sets within 50 miles of the nearest broadcasting station, and 15 s. ($3.55) per year for those over 250 miles, with intermediate rates for distances of between 50 and 250 miles.

About 150 receiving sets have been installed. Many are British and a few American. Programs are received from stations in the Union of South Africa and Kenya. Short-wave reception is becoming increasingly popular.

SOUTHWEST AFRICA

Language, German; area, 322,000 square miles; population, 227,739

Interest in radio is growing in Southwest Africa, but, because of the distance from broadcasting stations, little has been accomplished as yet. The Government is generally interested in radio development, but the small proportion of white population will probably limit advancement for some years. All seasons are warm, with reception fair throughout the year. Receiving installations number 50, principally British. Reception is possible only from stations in the Union of South Africa. Alternating-current sets are practically unknown. Short-wave reception is becoming popular.

SPANISH AFRICA

Language, Spanish; area, 140,000 square miles; population, 980,000

Aside from the Canary Islands, there has been little progress made by radio in Spanish Africa. Although radio is popular among the few whites, conditions are not favorable to its promotion, the distance from broadcasting stations in all cases being the principal retarding factor. In all of Spanish Africa summers are hot and winters warm, with poor reception.

There is no broadcasting in any part of Spanish Africa, aside from the Canary Islands. Rio de Oro and Spanish Morocco, as well as the Canary Islands and French Africa, receive broadcasts from Spain.

The total number of sets in use is estimated at 150, including several American and various European types. Neither alternating-current nor short-wave receivers have been introduced.

SWAZILAND

Language, native dialects; area, 6,678 square miles; population, 117,877

Radio has had no development in Swaziland. Summers are hot and winters warm, reception being poor at all seasons. Only five receivers have been installed, all believed to be British. Broadcasting from South African stations is received.

TANGANYIKA

Language, Arabic; area, 373,494 square miles; population, 4,123,493

Radio development in Tanganyika has been limited to a considerable extent by the distance from broadcasting, but the establishment of the new station in Kenya is expected to improve this condition. It is hot at all seasons, with poor reception. About 10 receiving installations are in service, mostly British.

TUNISIA

Language, French; area, 50,000 square miles; population, 2,159,758

The French and other Europeans in Tunisia have shown considerable interest in radio, and developments are comparatively well advanced. Though the climate is not the best, reception from France is easily accomplished, while the broadcasters in Tunisia provide programs of local interest. Summers are hot and winters warm. Static is bad throughout the year.

Three broadcasting stations are operating in Tunisia, one on short waves. French broadcasts from Algeria, Morocco, and France are received, as well as other European stations. Receiving licenses are required, costing 20 francs per year. A recent estimate indicates that about 1,000 sets are in service. The majority are French, the remainder of various makes. Short-wave reception is meeting with considerable success and is arousing some interest.

UNION OF SOUTH AFRICA

Language, English and Dutch; area, 472,347 square miles; population, 6,928,580

Radio in the Union of South Africa has shown considerable development. The Government has taken a great interest in promoting the use of broadcasting. The whites are particularly enthusiastic, and, while the financial end of broadcasting has proved a difficult problem, it is apparent that progress will continue. Radio dealers have agreed to contribute 10 per cent of their net profits in radio toward the cost of broadcasting and to include the cost of the license in the sale price of each set, giving a voucher for which the broadcasting company will exchange a license. Meanwhile, the Government has under consideration the abolition of licenses and using instead a 25 per cent import tax, most of which would be paid over to the broadcasters. Newspapers have taken a position adverse to radio, however, considering it a competitor in the field of advertising, with resulting friction that has somewhat retarded its development.

The principal cities are Johannesburg, Cape Town, Durban, Pretoria, Port Elizabeth, and Benoni. About 1,500,000 of the population are white. The country for the most part consists of plains. Radio reception is always good and is best from June to August.

The postmaster general has supervision over radio matters. Broadcasting is a regional monopoly, each station being licensed to operate exclusively within a certain territory for a period of five years.

Three broadcasting stations are now operating in the Union of South Africa. One of these uses double waves to provide short-wave transmission. While reception from Europe and the Americas is frequently accomplished, it is not very satisfactory. Receiving set owners are subjected to the payment of license fees ranging from £1 for sets situated over 200 miles from the nearest broadcasting station to £1 15s. for sets under 100 miles. The intermediate charge is £1 5s. Higher rates are provided for sets used elsewhere than in homes.

The licensed receivers in service have a total of 20,000, while a large number of unlicensed sets are known to be in use. British sets predominate, but American makes are popular and a large number are in use.

Some interest in alternating-current sets has been aroused. Short-wave reception has been popular for several years, particularly among the exceptionally large class of amateurs.

ZANZIBAR

Language, Arabic; area, 1,020 square miles; population, 215,879

There has been practically no promotion of radio in Zanzibar. Five receivers are in use, all British. The only programs satisfactorily received are from Kenya. All seasons are hot, with poor reception.

SERVICES OF THE BUREAU OF FOREIGN AND DOMESTIC COMMERCE

CHOOSING REPRESENTATIVES

In the selection of representatives in foreign countries it is recommended that the commercial intelligence division of the Bureau of Foreign and Domestic Commerce be consulted. That division is prepared to furnish lists of foreign firms and to give special information on those whose general qualifications are satisfactory. This information is supplied to bona fide American firms without charge.

IMPORT DUTIES

The importation of radio apparatus into various countries is subject to a wide variety of tariffs and import restrictions. These not only vary between countries, but the laws of countries are constantly undergoing change. New interpretations also strongly affect the rate of duty on various articles. For these reasons it is not feasible to include tariff rates in this publication, but such data will be provided to American exporters upon request addressed to the foreign tariffs division of the Bureau of Foreign and Domestic Commerce.

BRANCH OFFICES OF THE BUREAU

The Bureau of Foreign and Domestic Commerce maintains about 70 branch offices in commercial centers throughout the United States, through which all of the services of the bureau are extended to American business men. While most of the problems that arise can be satisfactorily handled by correspondence, it is recommended that more difficult questions be taken up direct with the nearest branch office. Through personal contact the managers and foreign-trade secretaries of these offices are able to give better service in the solution of such problems, while at the same time the exporter becomes more familiar with the ways in which the bureau can be of service.

PUBLICATIONS

The Bureau of Foreign and Domestic Commerce has issued a catalogue of publications for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., and by district offices of the bureau. This catalogue will be supplied upon request.

The electrical-equipment division has prepared a number of studies of particular markets for electrical goods, including radio apparatus. These studies have been issued as Trade Information Bulletins as follows: No. 487, Australia; 496, Brazil; 505, Japan; 508, Peru; 511, Colombia and Venezuela; 513, India; 515, Chile; 519, Mexico; 526, Southern Wales; 531, Irish Free State; 536, Argentina; 558, United Kingdom; 563, Central America; 565, Germany; 578, Belgium and the Netherlands; 596, Spain; 609, Germany (household appliances); 727, Netheland East Indies; and 730, Great Britain (household appliances). These bulletins are sold at a uniform price of 10 cents.

A study of the South African market (Trade Promotion Series No. 101) is sold at 15 cents.

UNITED STATES GOVERNMENT RADIO SERVICES

Numerous offices of the United States Government are interested in the various phases of radio, and it is deemed advisable to publish the following partial list for the information of readers of this bulletin.

DEPARTMENT OF COMMERCE

Bureau of Foreign and Domestic Commerce.—Electrical-equipment division: Foreign markets for radio apparatus; foreign broadcasting services. Special-

ties division: Facilities for radio advertising abroad. Transportation division: Foreign radio communication services (international).

Radio Division.—Administration of radio matters in the United States, its Territories and possessions; American agent for the International Radiotelegraph Bureau (Berne Bureau) publications.

Patent Office.—Radio patents.

Bureau of Standards.—Research in radio science; testing and calibrating of radio apparatus.

FEDERAL RADIO COMMISSION

This independent commission was created by the radio law of 1927 and empowered by section 5 of that law to classify radio stations and institute regulations for the maintenance and improvement of radio services in all classes, to assign wave lengths and call letters, limit power, control the selection of sites for stations, regulate types of apparatus, govern chain broadcasting, require the maintenance of records as to programs, communications, and signals, prescribe qualifications for operators, control the licensing of stations in each class and of operators, and to regulate the use of radio on railroad trains. Control over the possible future transmission of power by radio also comes within the province of the commission.

DEPARTMENT OF AGRICULTURE

Radio division: Extending the use of radio to farmers and arranging agricultural broadcasts.

In addition to these, the War and Navy Departments maintain the radio services of the Army and Navy and occasionally publish bulletins covering standard sets used; the Navy Department broadcasts time signals for marine purposes, employing simultaneously a broadcast wave length for the benefit of broadcast listeners. The Weather Bureau broadcasts weather forecasts. In a similar way various other offices investigate or use radio.

A complete list of radio publications for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., may be obtained from that office on request.

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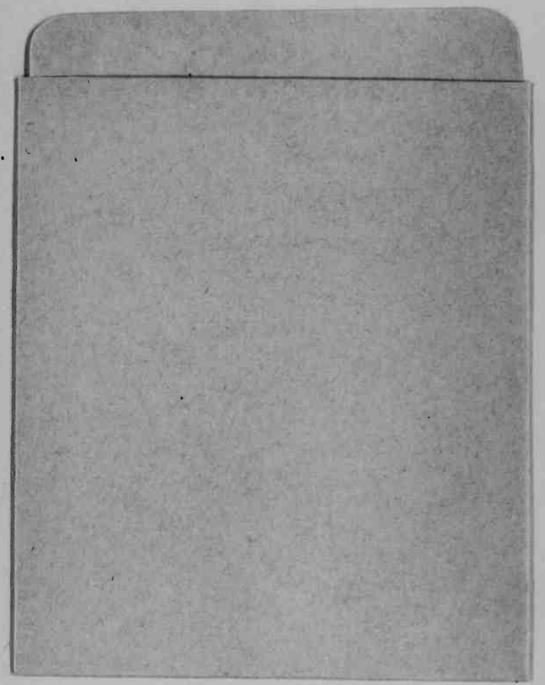

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